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Editorial Notes.

The Brighter Side.

THE United States mail towards the close of last week brought us a particularly cheery offering in the form of a supplement to the October issue of the "American Gas Association Monthly." The arrival of this document was especially opportune in view of an epoch marking event which had taken place a day or two earlier, and to which reference will presently be made. No time was lost in ascertaining the nature of this supplement; and the reward was immediate, for the sentences upon which the eye first fell were these: "Roger W. Babson places the "gas industry ahead of all other industries as offering "the greatest opportunities for future development. Mr. "Babson places gas first, then aviation, then electrical, "then radio." Such sentiments are bred from a spirit of breezy optimism which, even if it may be considered to put things a trifle high, is yet vastly to be preferred to a spirit of pessimism which might place matters far too low. It is such optimism as we have here that gives a man "stomach to fight." Another virtue is that it is contagious; the main vice of pessimism lies in precisely the same fact.

Mr. Babson is an influential man in the commercial life of the States; and the remarks just quoted were voiced by him at the Annual National Business Conference, at Babson Park, Mass. They were made some six weeks ago, when he was predicting a general "crash" in the stock market; and his desire was to point to the fact that gas securities offer attractive investment possibilities, because he feels that the average investor probably does not realize the tremendous growth which is taking place in the gas business.

According to Mr. Babson, there are to-day some 20,000 new uses for gas which were unknown fifteen years ago; while nearly one-half of the population of the States are using gas service. Long-distance transmission has been proved to be economically feasible. "In fact," he adds, "some authorities now state that it is actually cheaper "to transport gas than it is electricity." There are, of course, wide differences between the conditions governing the American gas industry and those operative here; and Mr. Babson doubtless was speaking from the point of view of affairs on his own side of the Atlantic. Even so, however, this exposition of the brighter side is a tonic for which we are duly grateful.

Greetings.

LAST week's important event which was so appropriately followed by Mr. Babson's statements was, it need hardly be pointed out, the address by Sir David Milne-Watson, LL.D., from his office in Westminster, by wireless telephony to the 6000 delegates who attended the Convention of the American Gas Association in Atlantic City. Sir David spoke for over twenty minutes on Wednesday afternoon; and in that time he did much more than convey to the President (Col. Oscar Fogg) and members of the Association the fraternal greetings of the members of the National Gas Council of Great Britain and Ireland, of which he is President. The delivery of the address to this vast audience over 3000 miles away was rendered possible by the marvellous progress of a science whose opportunities for future development Mr. Babson places after those of gas, but which can be of the utmost value in maintaining that close relationship between kindred peoples the overwhelming case for which was emphasized in the address.

What Sir David had to say must have been received with keen appreciation by his hearers; and it will be warmly endorsed by the gas industry on this side. Each must have something to learn from the other; and possibly the direction in which the experience of America is likely to be of outstanding use to us is in connection with the building-up of scientific rate structures.

The Coal Trade Situation.

DURING the past few weeks we have been endeavouring, like many other people, to follow the developments in the coal industry which have been the subject of so many reports, rumours, denials, and so much propaganda by interested parties. Truth to tell, we have been waiting for a stage to arrive at which a clear view could be taken of the situation. Though the position, as we see it, is more involved and complicated by cross-issues than ever, certain facts have come to light during the past week which may well be made the subject of a note.

In the first place, it is quite clear that the industry is once again in the forefront of the political issues of the day. This is as it should be, or otherwise, according to our individual political views. As we are attempting only to summarize facts, we will not discuss the point. But it is not open to question that the coal trade of this country during the current year has expanded in a very satisfactory manner, that export markets have been recovered which were in other hands ever since the long stoppage of 1926, and that the industry has shown the first signs for many years of nearly making ends meet. The coalowners attribute this to the lowering of costs of production which has been made possible principally by the greater output per man-shift which resulted from the re-introduction of the eight-hour day after the stoppage. And, the greater prosperity being mainly in export trade, which is largely a question of prices in open competition, the explanation appears a very sound one. The present Government, having been elected partly on a pledge to restore the seven-hour day, have now declared themselves ready to do so, and here is the second clear-cut fact, that they propose to introduce early legislation to deal with half-an-hour; the other obnoxious half-hour to be removed at a later date. This is a clear recognition that the issue is not so simple as it appeared in election programmes, but there seems to be no doubt in their minds as to the view of the majority of the House of Commons, which will presumably be necessary to carry the proposal.

It must be as clear to the Government as to anybody

else that the export coal trade depends more upon price than anything. They cannot contemplate the reduction in working hours being counteracted by a reduction in wages, which are generally acknowledged to be low enough already; and this leads to the third salient feature in the situation, which is that pressure has been exerted upon the coalowners to submit, for Government approval, a "selling scheme" which purports to co-ordinate a series of selling schemes evolved by each coal district, and which is intended to improve the average selling price to counteract higher costs. This, frankly, we do not like any more than the majority of the owners, who, without the least enthusiasm, have produced something rather than have it produced for them. In the first place, the world coal markets are open to general competition, and no foreign consumer can be compelled to buy English coal. Up to a point where foreign coal can be imported into this country, the home consumer *can* be made to pay up, and any scheme to bolster up wages must depend largely upon this principle. Holding, as we do, a brief for one of the chief home consumers, we object. In the second place, restriction of output is a salient feature of such schemes as have already been working, and is, we believe, to figure in the new national scheme. Here, again, the principle is unsound, because restriction falls equally upon all concerns, whether they are modern payable propositions or collieries which could never hope to pay again. These are two of the main obvious objections, without discussing difficulties of detail. Add to this that the Government will not necessarily approve of the owners' scheme, that some of the owners have already publicly hinted that the trade does not yet belong to the Government, and it is clear that there are considerable rocks ahead.

Another ugly feature in the situation is that some of the district wages agreements are due to expire shortly, or are subject to early notice by either side. They have practically all turned out unfavourably for the owners, while there have been no advances for the miners under the profit sharing conditions of them. The men, apparently with the moral support of the Government, are going all out for a national agreement, which the owners declare they will not even discuss. One more point may be mentioned in this not very cheerful summary of the situation. The Government have declared their intention of introducing an early measure for the nationalization of the mining royalties. As we see it, this step would not greatly affect the situation, though it has long been urged by the miners and by certain political parties as one of the essentials in any return to coal trade prosperity. The royalty owners would no doubt gladly sell if the price was good. The nation might conceivably make a profit, though examples of profitable nationalization are few and far between in the world's history. We will leave this point with the comment that the step was approved by the Samuel Commission, for whose findings we have every respect. For the same reason we do not discuss the merits and demerits of a national agreement, the principle of which was approved by the same Commission. In the meantime, the uncertainties of the situation are adversely affecting markets. The Government are obviously not happy about it, the men are being asked whether part of the loaf will not satisfy them for the time being, the owners are rather naturally asking what they will be made to do with their own property next, and the man in the street is too bewildered to follow the game with the least understanding.

The Value of the B.Th.U.

We are constrained to suggest to Mr. Ronald D. Keillor that some of the sweeping statements he made in his Presidential Address before the Scottish Junior Gas Association (Western District)—see later pages—do not contain an undue amount of substance. His main idea is clear enough; he likes gas of 410 B.Th.U. There is no harm in this preference, but, when he implies that other undertakings should share his view, then his reasons should be convincing. It is on this aspect of the case that we desire to comment, albeit briefly.

The problem really boils down to the time-worn query, Is one B.Th.U. as good as another? Regarding this, we hold the opinion that, for ordinary domestic purposes, and provided that specific gravity is controlled within narrow limits, the practical answer is in the affirmative when the supply of gas is uniform. Mr. Keillor thinks otherwise, basing his idea largely on theoretical conceptions of that very elusive quality, flame temperature, which is a veritable trap for the unwary. "One has only to observe the high intrinsic brilliancy in a medium-size incandescent mantle supplied with 410 B.Th.U. gas, compared with (say) 550 B.Th.U. gas, to realize the difference in favour of the lower quality." As Mr. Keillor is not aware that any real attempt has been made to determine the candle power of incandescent mantle burners with gases of varying calorific value and composition, he suggests research in this direction. We would remind him of the work of the Gas Investigation Committee of the Institution of Gas Engineers and the University of Leeds; the question has been studied for several years in very great detail and from many angles of approach, and the findings of the Committee show that flame temperature is only one phase of the efficiency of gas lighting, or, indeed, of other domestic applications of gas.

Fewer figures and clearer definition of the basis of calculation would have rendered the address easier to follow. It is difficult to appreciate, for instance, what the "net calorific value of combustion products" means. Do combustion products burn? Also, it seems, Mr. Keillor has not placed sufficient emphasis on the fact that rate of B.Th.U. input governs the efficiency of a particular gas appliance. Every piece of apparatus has an optimum rating; and the closer this is approached in practice, the better the results. It is understood, of course, that a cubic foot of rich gas requires more air for combustion than does a cubic foot of lean gas; but it has to be remembered that less of the rich gas is required to cope with the B.Th.U. input demand, and that, in the result, the volumes of products of combustion in both cases may not be very different. One of the findings of the Gas Investigation Committee was as follows: "A "difference in the grade or composition of the gas sup- "plied within wide limits does not cause any considerable "difference in the radiant efficiency of a gas fire, pro- "vided that the mechanical construction of the fire will "allow sufficient gas to be passed, so that the same "number of B.Th.U. per hour can be supplied to the "radiants."

Mr. Keillor asserts that the latitude in gas quality allowed by the Gas Regulation Act is too extreme, and that it would have been better for the industry if a standard quality had been prescribed for the whole of Britain. "Had this been done," he says, "economic production would have developed at a more rapid rate." We think that, had this been done, the consumer would have suffered very badly indeed, not as regards gas quality but in respect of gas prices; and our argument applies particularly to conditions as they existed in 1920. Manufacture is only one phase of gas service, and the amount of capital which would have to be expended in certain districts to allow of the efficient distribution of a lower grade of gas, determined arbitrarily by an external authority, would not be warranted by the results. Moreover, one of the chief assets of the gas suppliers is that they have a flexible process which can be modified to suit local conditions and market fluctuations. Carelessly to destroy this asset would be absurd. If we look into the future, we may believe that large areas will be served by interconnecting mains, which will necessitate uniform gas throughout the area; but it does not follow that flexibility of particular works supplying gas to the mains system will on this account no longer exist. As a final note we refer to Appendix D of Mr. Keillor's address. He calculates for several undertakings the value of the products per ton of coal carbonized; and assuming that in every case gas is sold at the Greenock figure of 7·55d. per therm, he finds that the value of gas and residuals *less* cost of coal increases with decreasing calorific value of the gas supplied. If an undertaking depended solely on complete gasification, then the corresponding figure would appear still greater. Without knowing the cost at which the therm can be produced in gas at different calorific values by the same undertaking, Appendix D does not lead us far.

Medium-Temperature Carbonization.

Defining the range of low-temperature carbonization as 700° to 1100° Fahr., and of high-temperature carbonization as 1800° to 2000° Fahr., Prof. S. W. Parr, in a paper before the American Gas Association, an extract from which appears in our columns to-day, extols the virtues of mid-temperature treatment—1200° to 1500° Fahr.—by the system developed at the University of Illinois. The idea is to preheat the coal to 500° Fahr., charge it into an oven of standard type maintained at the usual temperature (*circa* 2000° in the combustion flues), and push the charge after five hours. Those who desire a detailed description of the process will find it in the Transactions of the Second International Coal Conference.

The object of Prof. Parr's system is to secure a yield of gas which will be attractive to the gas-maker, and an output of coke suitable for the domestic market, for complete gasification, or for burning under boilers. The programme is involved, but it must appeal to the gas engineer as one worth thinking about, even if at present it seems to hold little chance of economic success. The question is whether it will ever be practicable for the carbonizer simultaneously to satisfy the requirements of a domestic market for gaseous and solid fuel and of an industrial market for solid fuel; and the solution, we suggest, may lie in the willingness of the suppliers of electricity to take the industrial fuel produced. Prof. Parr maintains that a domestic coke should have, among other qualities, a ignition temperature of about 270° C., that his system can produce such a fuel, and that this fuel also functions admirably in the water gas plant or in the power station. At the same time the method, he states, can yield sufficient gas for the latter to be the main prospect for revenue—about 6000 c.ft. per ton.

While it is obviously impossible to prophesy whether Prof. Parr's vision will ever become a reality, it is manifestly absurd to dismiss the matter as the idle scheme of a dreamer, or to imagine that a change of ideas and conditions could not in a few years revolutionize the supply of gas, electricity, and smokeless fuel, perhaps co-ordinating three branches into a working whole still more economic and still more advantageous to the community.

A Reminder.

Readers may be reminded that the outstanding feature of the Eighteenth Annual Conference of the British Commercial Gas Association, which is being held at Eastbourne from Oct. 28 to 30, will be the visit of the Duke and Duchess of York, on Tuesday afternoon, Oct. 29. Among the leading speakers during the Conference will be Lord Eustace Percy, M.P. (Past-President of the Board of Education); Sir Lawrence Weaver, K.B.E.; Dr. C. W. Saleeby, F.R.S.E.; and Mr. A. Hayday, M.P. (Vice-President of the National Union of General and Municipal Workers).

Illuminating Engineering.

Many who read these lines will have been more or less closely acquainted with the late Mr. Leon Gaster, who became widely known in the gas industry through founding the Illuminating Engineering Society. Mr. Gaster was an enthusiast in a good cause; and it is no more than justice that his work should be commemorated. Arrangements are being made to institute a "Leon Gaster Memorial Fund;" and an announcement appearing on another page makes recognition of the fact that, while the appeal for contributions is addressed primarily to the members of the Illuminating Engineering Society, possibly some others to whom Mr. Gaster was known may like to identify themselves with the scheme by making some contribution to the fund.

The Education Scheme.

During the six years that it has been in operation, there is probably no subject that has aroused more widespread interest in the gas industry than the Education Scheme of the Institution of Gas Engineers, which it is hoped has now been placed upon a footing that will be universally satisfactory. This year's revision of the Scheme is the third to be undertaken; and its importance is such that we have felt readers would welcome an explanatory article written by an authority upon the subject. Such an article, therefore, appears in the present number of the "Journal." It is hoped that all potential students will carefully study the article; and if they do so, we shall feel more than amply rewarded for having published it. In case it may be overlooked, however, by some over-hasty reader, it may be well to repeat here the following few lines from the article: "The perplexed or doubtful student should always apply for counsel and guidance to the Secretary of the District Committee in whose area he resides. Much worry and anxiety are caused through ignorance of the educational facilities which are available. The District Committees have been formed for the express purpose of smoothing the way of the earnest student. In special cases they have been instrumental in procuring tuition where otherwise it could not have been obtained. It must always be to the advantage of the student to obtain the best instruction possible. His future career depends largely upon success in his studies. In any case of doubt, therefore, the student is advised to communicate with his District Committee before making any arrangements for commencing his course of study." A list of the Chairmen and Secretaries of the District Committees is included in the article. Full particulars of the revised Scheme have now been published in book form; and any communications regarding the new regulations should be addressed to the Organizing Secretary, at 28, Grosvenor Gardens, S.W. 1.

Gas Poisoning Inquiry.

The Gas Poisoning Committee sat twice last week, and heard a good deal of evidence. The lengthy report of the proceedings which we publish to-day includes some points that should not be missed. Mr. E. J. Silcock had much to say regarding the report of the Special Committee of the Surveyors' Institution to which he acted as Chairman. This report was reproduced on p. 870 of the "Journal" for June 19 last. Witness enumerated the various conditions which now involve greater risk of fractured mains and defective joints than formerly was the case. In spite of these causes, he said, there does not seem to be any marked increase in the total number of failures of mains through bursts or leakages; but there are indications that the cumulative effect of these various circumstances has produced a slight increase in the amount of gas which escapes into the subsoil.

Ventilation.

The Committee of the Surveyors' Institution considered that some provision should be made for the adequate ventilation of the subsoil under roads, to compensate for the loss of ventilation due to the impervious nature of modern road surfaces. This Mr. Silcock admitted to be a difficult problem. He pointed out the disadvantages of gratings, either in the carriageway or in the footpath, and suggested that possibly lamp columns in street refuges might be utilized as outlets, or special columns might be erected for the purpose along the edge of the footpath. Witness found himself unable to agree with Prof. R. V. Wheeler (a member of the Committee), who, pressing the point that there must be a better method of construction of roads than that adopted at present, said it seemed to him that the Committee of the Surveyors' Institution had been placing the onus on the wrong set of people, and that the surveyors should devise better methods of road construction, so as to allow the inevitable leakage of gas to escape. At the end of that day's proceedings, Mr. F. J. Wrottesley, K.C. (another member of the Committee), said he gathered that the Committee of the Surveyors' Institution had not been very much impressed by evidence of leakages of any serious nature into houses; and he asked whether they had evidence that it was in fact occurring more frequently now than formerly. Witness replied that they had not; and Mr. Wrottesley, examining some statistics, said there was nothing very striking in them to indicate that there had been more accidents in the last few years through the leakage of gas into houses than there were formerly.

Suicide by Gas.

Valuable evidence with regard to suicide was given by Dr. Samuel Ingleby Oddie (Coroner for Westminster and for the South-Western Division of the County of London), when he appeared before the Committee who are sitting to consider the increase of deaths due to poisoning by coal gas supplied for domestic purposes. He made a point which has on occasion been emphasized in these pages—that juries, from sympathetic motives, sometimes take the view that deaths are accidental which in all probability are cases of suicide. In his own district, drowning is responsible for the largest number of suicides; while gas poisoning is relegated to third place. A significant fact is that during the time he has been Coroner the total number of suicides in his area has not varied very much; being round about a hundred a year. Thus the increase in the suicides by gas has been due, not to an increase in the total number of suicides, but to a change in the fashion. An explanation of this tendency is that the far greater use during recent years of domestic gas for cooking and heating has rendered the process of committing suicide by gas much more easy and certain. Asked whether there was anything which called for further precautions with regard to the nature of the gas supplied to the public, Dr. Oddie replied that from the point of view of accidental gas poisoning he had no fears whatever; while nothing would prevent a person committing suicide, if he determined to do so.

Distinctive Share Numbers.

A few weeks ago, when referring to recent City scandals, we ventured to express the opinion that these happenings would afford valuable arguments in the controversy regarding the proposal to abolish distinctive share numbers. When first the suggestion was put forward, the Stock Exchange Committee issued a memorandum. Cases of duplication of shares, the Committee said (this was eighteen months ago), had occurred in the past, and would be made easier in future if distinctive numbers were no longer compulsory. They added that distinctive numbers must always be valuable for the purpose of tracing shares when any doubt is thrown upon their validity. Alluding to the subject a few days ago, "Autolycus" of the "Financial Times" said: "Recent events make it perfectly clear that the Stock Exchange Committee's desire to maintain the protection of the public through the retention of share numbers was based upon the soundest lines." We agree. Saving of trouble would be dearly secured should efficiency be endangered thereby.

Corporation Loans.

The unfortunate position in which the Wakefield Corporation find themselves through the Hatry collapse was discussed at a crowded meeting convened by the local Property Owners and Ratepayers' Association. A large sum of money was left with the Corporation and General Securities, Ltd.; and an inquiry into the circumstances is felt to be desirable. This demand, however, is not based upon any wish to establish bad faith or irregular conduct, but is made with a view to providing better safeguards both for the raising of municipal loans and for the disposition of money temporarily not required for specific purposes.

Road Tar in Brazil.

Mr. C. H. Carder, the Chief Engineer of the Gas Department of the Rio de Janeiro Tramway, Light, and Power Company, is doing good work in helping to popularize the use of tar for road making and surfacing in Brazil. A Pan-American Highway Congress was held in Rio last August, under the official auspices of the Governments of the various countries of both North and South America; and Mr. Carder presented to the Congress a thesis on the use of road tar in highway construction. In later columns will be found an article from his pen, entitled "Modern Roads," in which effective use is made of figures, already published in the "Journal," showing the development of the use of tar in France and at home. A report by Dr. Marcello Taylor Carneiro de Mendonça, one of the Engineers of the Gas Department, on demonstration work carried out in Curityba, the capital of the State of Paraná, at 3150 ft. altitude, makes very interesting reading. Full construction details and costs are given for 1000 sq. yards of tarmacadam and 2300 sq. yards of penetration macadam which were laid with apparently very satisfactory results, even though temperature changes in early April ranged from 46° Fahr. at 7 a.m. to 100° Fahr. at mid-day.

Gas Manageresses.

We well remember the time when Miss Ina G. Richmond was in charge of the Magherafelt Gas-Works in Ireland, and performed the most laborious tasks; and we had thought her the only Gas Manageress. The official organ of the American Gas Association has, however, revealed the fact that there are others, though their duties would seem to be of a far different kind from those which fell to the lot of Miss Richmond. Even the "A.G.A." a month or two ago thought there were but two women in the world who were in charge of gas companies. These were Miss Mary Dillon, President of the Brooklyn Borough Gas Co., Coney Island (N.Y.), and Miss Viola Luhring, Manageress of the Waverly Gas Company, Waverly (Iowa). Now another woman who has complete charge of a gas company has been found. She is Miss Flora Kollmeyer, Manageress of the Columbus Gas Light Company, at Columbus (Ind.). Miss Kollmeyer has been connected with the Company for about ten years, and has been Manageress for two years. Columbus has a population of 12,000, and the Gas Company force numbers twelve. The plant itself contains both water gas and coal gas equipment.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Oct. 24-25.—Institute of Fuel.—Annual conference at the Institution of Mechanical Engineers.

Oct. 25.—London and Southern District Junior Gas Association.—Opening meeting and re-union at the Westminster Technical Institute at 7.30 p.m.

Oct. 28-30.—British Commercial Gas Association.—Annual Conference at Eastbourne.

Nov. 2.—Midland Junior Gas Association.—Visit to Saltley Works, Birmingham.

Nov. 6.—London and Southern District Junior Gas Association.—Visit to the Works of the Stanton Ironworks Company, near Nottingham.

Nov. 7.—Midland Association of Gas Engineers and Managers.—Autumn meeting in Birmingham.

Nov. 7.—Gas Companies' Protection Association.—Annual meeting, Caxton Hall, Westminster, 2.30 p.m.

Nov. 9.—Scottish Junior Gas Association (Eastern District).—Joint Meeting with Western District in Glasgow.

Nov. 13-14.—Institution of Gas Engineers.—General meeting in London.

Nov. 14.—Midland Junior Gas Association.—Meeting in Birmingham. Discussion on the "Relative Advantages of Iron and Lead for Internal Carcassing."

Nov. 20.—Society of British Gas Industries.—Autumn General Meeting, Hotel Metropole.

Nov. 22.—Southern Association of Gas Engineers and Managers.—General meeting at the Hotel Cecil, Strand, W.C., 2.15 p.m.

Nov. 28.—Midland Junior Gas Association.—Visit to Biscuit Factory of Messrs. Alfred Hughes & Sons, Ltd., Birmingham.

Gas Companies' Protection Association.—The annual general meeting of the Association will be held at Caxton Hall, Westminster, S.W. 1, on Nov. 7, at 2.30 p.m.

Midland Association of Gas Engineers and Managers.—The autumn general meeting of the Association will be held at the Grand Hotel, Birmingham, on Nov. 7, under the Presidency of Mr. C. M. D. Belton, of Shrewsbury. Mr. Fred Davies, Engineer and Manager to the Walsall Gas Department, will read a paper entitled "The Replacing of a Lattice Column Gasholder by One of the Spiral Type," with remarks on the adaptation of the brick tank to the new conditions.

PERSONAL.

PRESENTATION TO MR. THOMAS GLOVER.

In the course of the long history of the British Gas Light Company there have doubtless been many similar gatherings, but there can rarely have been a happier party than that which met in the Royal Hotel, Norwich, on Tuesday, Oct. 15. The occasion was a dinner given by the Company in honour of Mr. Thomas Glover, to enable the Directors and the chief officials with whom he had been associated to offer him personally their congratulations upon his past work, and their best wishes in his retirement.

The company consisted of the Chairman and Directors, officials from the Chief Office and the Norwich Station and from the local subsidiary Undertakings of the Company, and Mr. C. R. Armitage, the newly appointed Engineer. After the Loyal Toast had been duly honoured, the Chairman, Mr. Henry Woodall, proposing the long life and happiness of "Our Guest," said that he was not going to give an account of Mr. Glover's activities, as they were so many and important that the evening was not long enough to recount them; but all would agree that he had a record of which any man might be proud. In the course of his remarks, Mr. Woodall referred to Mr. Glover's public work in Norwich, and to the fact that he was remaining in the city where his reputation stood high and where he had many friends. Addressing Mr. Glover, the Chairman thanked him on behalf of the Company for his past services, and asked him to accept a secretaire-tallboy as a parting gift, and a cheque to facilitate the moving to his new home.

The toast, supported by the Deputy-Chairman, Mr. H. G. Palmer, in happy vein, and by Mr. A. W. Brookes, who referred to the long years during which he was associated as Secretary with Mr. Glover, was received with acclamation.

Mr. Glover, in returning thanks, said that at present he felt rather like a piston without a cylinder, but was glad that he had many interests in Norwich to which he could devote his energies.

Further speeches of tribute to Mr. Glover were made before the termination of an enjoyable evening.

Mr. W. F. Falkner has resigned the position of Engineer and Manager to the Dursley Gas Light and Coke Company, Ltd.

Mr. A. C. Turner, Resident Works Foreman of the Saltash Gas Company, has been appointed Manager of the Alresford Gas Company.

OBITUARY.

HENRY NIELD BICKERTON.

With regret we record the death of Alderman Henry Nield Bickerton, J.P., C.C., M.I.Mech.E., Founder and Managing Director of the National Gas Engine Company, Ltd., on Oct. 6, at Thornycroft Hall, Chelford, in his 73rd year.

Born in Oldham, Alderman Bickerton was educated at Tettenhall College, near Wolverhampton, and gained his early knowledge of engineering in the works of his uncle, in connection with the manufacture and erecting of printing machinery. He later commenced work in a small way on his own account in Park Street, Ashton. This was before the days of electrical power, when the usual method of driving was by means of a small combined vertical engine and coal-fired boiler. As an engineer he realized the desirability of a handier and more convenient method of producing power, and the advantages of dispensing with high-pressure steam, and the elimination of stand-by losses convinced him that the future development of prime movers for moderate powers must be on the principle of internal combustion.

He therefore set to work to design a gas engine, and in 1879 produced a two-cycle engine, of which he made a considerable number. Continuing his experiments, Mr. Bickerton afterwards designed a four-cycle engine which was simpler in construction and less costly to manufacture than anything else which had then been produced, and in 1890 he founded the National Gas Engine Company, which was in a position to place on the market immediately a reliable four-stroke engine at a price which brought it within the reach of a large number of power users who hitherto had regarded the gas engine as a rather expensive luxury.

Prior to the foundation of the National Gas Engine Company in 1890, Alderman Bickerton had removed his works from Park Street to Wellington Road, taking over the buildings formerly used by Isaac Boulton, the famous locomotive engineer. The National Gas Engine Company progressed by leaps and bounds from the day of its foundation, and, under Alderman Bickerton's able guidance, there was a continuous and remarkable development. To-day, the National Gas Engine Company is one of the largest concerns in the world in its branch of engineering, and it finds employment for over a thousand people.

In 1907, Alderman Bickerton, in association with his colleague, Mr. Charles Day, acquired the rights of Mirrlees, Watson, & Co., in the Diesel crude oil engine, and founded the Company of Mirrlees, Bickerton, & Day, Ltd., and established works at Hazel Grove, near Stockport. Alderman Bickerton was responsible for the development of the penny-in-the-slot gas meter.

Deceased was elected to the Ashton Town Council in 1904, and was made an Alderman in 1922. He was for some years a member of the Council of the Society of British Gas Industries, and was a regular attendant at their meetings. He leaves a widow, two sons, and four daughters. His eldest son, Mr. Henry Cooper Bickerton, was recently made a Director of the National Gas Engine Company.

We are very sorry to learn of the death, on Oct. 15, of Mrs. M. A. Kenshole, of Merthyr, wife of Mr. James E. Kenshole, Engineer and Manager of the Merthyr Gas Company.

We regret to have to record the death of Mr. Harry Mitchell, Proprietor of Messrs. H. Mitchell & Co., lock manufacturers and brass founders, at the age of 67. Mr. Mitchell was Chairman of the Horley District Gas Company and a Director of the St. Margaret's Gas Company.

The death occurred on Oct. 10 of Mr. Edmund Shaul, who for 44 years was Manager of the Penrith Gas-Works, during which period he saw the output increase from 18 million c.ft. per annum to over 60 millions. When Mr. Shaul had completed 40 years' services, the Penrith Urban Council and his fellow officials presented him with a Chippendale bureau and a bookcase to mark the esteem in which they held him. He also received a silver cigarette case and an illuminated address from the works employees, by whom he was always held in high regard. Mr. Shaul retired in 1927, and was succeeded by the present Manager, Mr. J. Corrigan, who had been his assistant for several years. The name of Shaul has been closely allied with the Gas-Works at Penrith for several decades, deceased's father being the Manager of the original private company, which was taken over by the Council in 1878.

The death has occurred, at the age of 79, of Mr. Frederick Charles Foster, J.P., who for half-a-century was closely allied with the municipal, political, and religious life of Bridgwater, which he served as Mayor in 1889 and 1897. For many years he was a Director of the Bridgwater Gas Light Company; and on the death of Mr. R. Y. Foley, J.P., a few years ago, he was appointed Chairman of the Company.

LEON GASTER MEMORIAL FUND.

Nearly two years have elapsed since the death of Mr. Leon Gaster, Founder, Vice-President, and Hon. Secretary of the Illuminating Engineering Society, whose loss has been so severely felt by the Society. During this period, the feeling has been present that there is a strong desire among members of the Society to commemorate in a fitting way the great services which he rendered to the Society and to illuminating engineering during nearly twenty years. The Council of the Society have concluded that there is no better way of doing this than by linking Mr. Gaster's name with some scheme which will further the aims which in his lifetime he strove so zealously to foster—namely, to increase the reputation of the Society, to stimulate a high standard in the papers and contributions which are submitted to it, and to encourage experiment, research, and investigation.

The Council have accordingly decided to institute a "Leon Gaster Memorial Fund." It is proposed that a fund of not less than £200 shall be collected, the interest on which shall be devoted primarily to the establishment of a Premium to be awarded annually for the best contribution from a subscribing member of the Society on any aspect of illuminating engineering which is submitted to the Illuminating Engineering Society during the year. It is proposed that the Premium should be used for the purchase of books, instruments, or apparatus, as the recipient may desire, and that it should be accompanied by a certificate on vellum recording the award. It is hoped that the requisite fund will be collected and the necessary Trust completed in time for the first award to be made in 1931.

While the appeal for contributions is addressed primarily to the members of the Illuminating Engineering Society, it is possible that some others to whom Mr. Gaster was known may like to identify themselves with this scheme to his memory, and to make some contribution to the Fund.

Contributions or promises should be sent to the Hon. Secretary (Mr. J. S. Dow, 32, Victoria Street, S.W. 1). Cheques and Postal Orders should be made payable to the Illuminating Engineering Society, and crossed "A/c Leon Gaster Memorial Fund."

SIR DAVID MILNE-WATSON, D.L., LL.D.,

Addressing, from his Office at Westminster, by wireless telephony, the 6000 Delegates who attended the Convention of the American Gas Association at Atlantic City.
Sir David was speaking on Wednesday, October 16, for over 20 minutes from 4.30 p.m.

GREETINGS ACROSS THE ATLANTIC.

Sir David Milne-Watson's Speech to the American Gas Convention.

On Wednesday, Oct. 16, Sir David Milne-Watson, D.L., LL.D., Governor of the Gas Light and Coke Company, and President of the National Gas Council, addressed by wireless telephony the Convention of the American Gas Association at Atlantic City in the following terms :

Col. Fogg and Members of the American Gas Association.

I am very sensible of the honour you have done me in asking me to address you, and I heartily welcome the opportunity afforded me of conveying to you, in your Eleventh Annual Convention, the fraternal greetings of the members of the National Gas Council of Great Britain and Ireland, of which I have the honour to be President, and of conveying to you our best wishes for the success of your Convention.

Those familiar, as we all should be, with the wonderful history of gas supply should not, I suppose, be unduly surprised by the marvellous developments which have been achieved in other spheres, but I confess that I find it difficult to realize that my voice is being heard, and I hope clearly heard, by each of you in the great Municipal Auditorium in Atlantic City over 3000 miles away. It is singularly appropriate that I should be speaking to what is undoubtedly the greatest assemblage of those concerned with the manufacture and supply of gas ever brought together, from the spot where, 117 years ago, gas was first made on a very modest scale and in a very crude way for distribution to the public in London by a small Company which has now grown to be, I believe, the largest Gas Manufacturing Company in the world.

These circumstances give an historic and a romantic touch to the occasion, and, in addition, the directness with which I am privileged to communicate with you produces a feeling of proximity which will, I hope, help me to convey to you the cordiality and sincerity of our sentiments towards you. We on this side of the Atlantic have had many proofs of your kindly interest. I recall with pleasure my all too brief visit to the United States last winter, when I had the privilege of visiting the offices and works of the Consolidated Gas Company of New York. I was greatly impressed by all I saw and heard; but what impressed me more than anything else was the warm welcome I received from all those with whom I came in contact, and the willingness with which I was supplied with the information I was seeking. I recall, too, visits paid by others connected with the gas industry of this country, from which they returned filled with admiration for American gas practice, and for the way in which every facility was afforded them, both by the officials of your Association and by the representatives of constituent members in all parts of the States, for obtaining knowledge of your methods in the most thorough and expeditious manner.

From time to time, too, we have had the pleasure of welcoming over here your President and other members of your Association. Mr. Samuel Insull is a frequent visitor, and I am always delighted to meet him and others who come across to see the conditions we have to encounter on this side, and how we seek to meet them.

A Duty to the World.

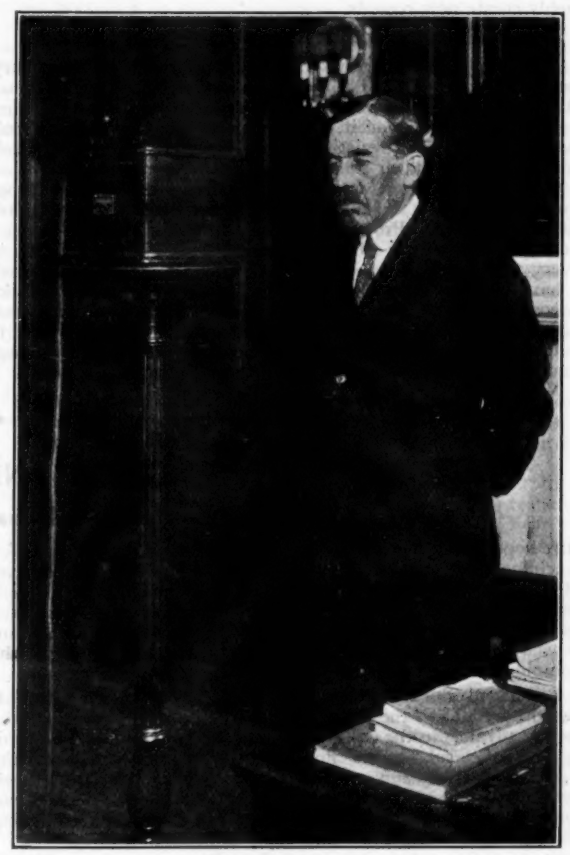
I sincerely hope that these visits will be multiplied, and the interchange of ideas extended, not only because they are of mutual advantage to us in our work, but also because they tend to strengthen the bonds between our two great nations. We hear much in these days of the great importance of a complete and harmonious understanding between the English-speaking peoples of the world, and there are few who do not anxiously desire to see that ideal attained. We have been following with intense interest the conversations to that end which have been proceeding between the President of the United States of America and the Prime Minister of this country. Complete understanding can, however, be reached only if there is goodwill and understanding between individuals and groups of individuals like ourselves, whose common interests, aims, and aspirations bring us into touch. Apart altogether, therefore, from our obligations to the constituent members of our respective Associations and to the public whom we serve, we have a duty to the world at large; and, as the performance of that duty is in my experience, and I hope in yours, both profitable and pleasurable, there is an overwhelming case not only for the maintenance but also for the intensification of our business and social relationships.

Another note which I wish to strike in my message to you from the gas industry of Great Britain is one of congratulation —congratulation not only because you are holding the greatest meeting of gas men and the greatest exhibition of gas appliances and equipment which have ever been held, but also because of all that the meeting and the exhibition imply. They are outward and visible signs of the enormous magnitude of the industry which you have built up, of the vast territory to which it extends, and of the efficiency and skill with which the manifold and ever-changing needs of millions have been met by the use of gas.

They indicate the tremendous financial strength of your industry and the leading rôle which it plays among the industries of the United States of America. They constitute a triumph of organization; and here a special tribute must be paid to those who conceived the idea of a large central organization and have been responsible for creating and carrying on with such conspicuous success the American Gas Association, and to Major Alexander Forward and the other officials of the Association whose multifarious and indispensable duties include the organizing of your great annual Conventions.

No Standing Still.

Above all, your meeting and your exhibition connote that there is to be no standing still in the gas industry of the United States. The triumphs of the past are but the stepping stones to future achievements. The programme of your Convention breathes that spirit of progress and development which has already found expression in your Association's far-famed Research Laboratory, and I feel sure that we shall soon see its fruits in the further perfecting of existing practice in many directions and in the successful occupation of new fields of usefulness and profit.



Sir David Milne-Watson, D.L., LL.D.

We have watched with admiration the growth of the industrial gas load to its present vast dimensions, and we are studying with the greatest interest the revolution which you have effected in the application of gas to your house heating problems, resulting in the elimination of dirt, labour, and noise, the setting-free of valuable space, and the establishment of a still higher level of domestic comfort.

Problems of Rate Structure.

The great advance which you have made in these two independent spheres is doubtless the reward of the careful attention which you have given to the problems of rate structure. We, too, have been studying these same problems; and when

some necessary legislative changes have been effected, we expect to find that our conditions will call for a solution somewhat similar to yours. Both upon your past and present achievements and upon the promise of those to come, I therefore offer you our warmest congratulations.

The problems and difficulties which face gas undertakings in different countries necessarily vary with national and local conditions. Legislation, distribution of population, economic, industrial, climatic and geographical conditions, natural resources, and other factors play an important part. The main purpose of gas undertakings, wherever they may be situated, is, however, the same. It is to give the best possible service to the greatest number of people, for the largest number of purposes for which gas can be used, at the cheapest possible rates. That this purpose has been, and is being, achieved is shown by the fact that, despite competition—keener than ever before in respect of both our primary product and our bye-products—the use of gas is steadily increasing. The figures speak for themselves.

I see that in the United States the percentage increase in the use of manufactured gas during the year 1928 was 3·8, while it is estimated that there was approximately a 10 p.ct. increase in the use of natural gas. The amount sold of the former was 490,000 million c.ft., and of the latter 1600 million million c.ft. were produced. These are stupendous figures—those for natural gas eclipsing all previous records—and they amply justify the claim that gas leads "fuel growth" in America. I am glad to be able to tell you that we on this side can also look back on 1928 with satisfaction, and the present year will probably create new records.

A Powerful, Healthy, and Progressive Industry.

We belong to a powerful, healthy, and progressive industry, possessing a history of which we all have reason to be proud. And if, as we develop our heritage, others from time to time cast envious eyes upon it, and even seek to enter it, we should have no difficulty in resisting them, for our vitality and aptitude for service have never been greater than they are to-day.

The last note, therefore, which I wish to strike is one of hope and confidence in the future of the gas industry of the United States and here. Prospects are bright, and their development, being in the hands of men who have proved their worth in every sphere which the gas supply service embraces, is assured. I have one regret, and that is that I am not "one of the lucky 6000" assembled in Atlantic City, but I am proud to think that you have had the Atlantic narrowed so that I could speak to you and express to you by word of mouth the hearty greetings and good wishes of the Gas Industry of Great Britain.

INVENTOR OF THE GAS MANTLE.

CARL AUER VON WELSBACH.

Born Sept. 1, 1858; died Aug. 5, 1929.

Photograph by courtesy of the "Co-Partnership Journal" of the South Metropolitan Gas Company.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

Any hopes there were of an improvement in prices on the Stock Exchange last week were speedily dispelled by a fresh outbreak of liquidation, which increased as the week progressed. Practically all markets were affected, investments being as depressed as the more speculative shares; and the position was not improved by the preparations for the carry-over which reduced the volume of business.

Gilt-edged stocks started with some show of strength, assisted no doubt by the better state of the Money Market and the steady advance in the dollar-sterling rate, but these had no avail against the subsequent liquidation. The full force of the liquidation was, however, in the Industrial Market. Fresh nervousness developed by reason of the Committee's statement regarding the enforcement of bargains; many shares falling almost to vanishing point and being difficult to deal in.

There was no outstanding feature in the Gas Market. Transactions were perhaps a little below normal; and it will be seen, from the list appearing elsewhere, that those recorded showed little variation in the price paid. With the swing of the pendulum, Imperial Continental capital stock lost the 10 points advance of the previous week, and European shares dropped 1 point to 13½-15½; but the ordinary stock of the Gas Light Company was again marked up, the advance being 3d. to 18s. 1½d.-18s. 7½d.

The general depression has naturally affected gas stocks, notwithstanding that the recent sensational events have no bearing thereon. One cannot help thinking that a little more publicity on the value of gas stocks by the various companies would result in an increase in the number of investors in such stocks.

The following transactions were recorded during the week:

Monday.—Aldershot 73, 73½, Alliance and Dublin 97½, 98, Cape Town 10, European 14¾, 15, 15¼, Gas Light and Coke 18s., 18s. 3d., 18s. 4½d., 18s. 6d., 4 p.ct. pref. 72, 3 p.ct. deb. 58, Imperial Continental 393, 398, 399, 399½, 400, 402, Montevideo 106½, 107¼, Primitiva 35s. 10½d., 36s., South Metropolitan 99¾, 100, South Suburban 5 p.ct. 102, 5 p.ct. deb. 94½, 95½, Tottenham 3½ p.ct. 105. Supplementary prices, Ascot 4 p.ct. deb. 65, 65½.

Tuesday.—Alliance and Dublin 96½, British 115¼, 116, Commercial 93, European 14½, 14¾, Gas Light and Coke 18s. 1½d., 18s. 3d., 18s. 3¾d., 18s. 4½d., 18s. 6d., 4 p.ct. pref. 71½, 3 p.ct. deb. 57½, Imperial Continental 396, 397, 398, 400, Oriental 112, 112½, Primitiva 35s., South Metropolitan 99½, 99¾, 100, 100½, Tottenham 3½ p.ct. 105. Supplementary prices, Grays and Tilbury "B" 11.

Wednesday.—Alliance and Dublin 97, Barnet 7 p.ct. max. 112½, British 116, Colonial 23s. 6d., Croydon sliding-scale 105½, 106, max. div. 82, European 14, 14¼, 14½, Gas Light and Coke 18s. 3d., 18s. 3¾d., 18s. 4½d., 18s. 6d., 4 p.ct. pref. 70½, 71¾, 3 p.ct. deb. 58, Imperial Continental 392, 395, Primitiva 4 p.ct. cons. deb. 81½, 81¾, San Paulo 6 p.ct. pref. 8¾, 9, South Metropolitan 99¼, 100¼. Supplementary prices, Liverpool 5 p.ct. deb. 99, Oxford 135, Tonbridge new "E" 179½.

Thursday.—Bombay 18s. 3d., British 5 p.ct. deb. 96½, European 13¾, 14¼, Gas Light and Coke 18s. 3d., 18s. 6d., 18s. 7½d., 3½ p.ct. max. 61½, 4 p.ct. pref. 70, 3 p.ct. deb. 56½, 57, 57½, 5 p.ct. deb. 99½, Imperial Continental 383, 385, 387, 389, 390, 393, Liverpool 7 p.ct. pref. 99, Montevideo 106, Primitiva 34s., 34s. 7½d., Sheffield cons. 100, Wandsworth, Wimbledon 5 p.ct., 105, Wandsworth new 98, 99.

Friday.—Barnet 7 p.ct. 113½, European 13½, 14, Gas Light and Coke 18s. 3d., 18s. 6d., 18s. 7½d., 4 p.ct. pref. 71½, 3 p.ct. deb. 56¾, 57½, 5 p.ct. deb. 99½, Imperial Continental 380, 382, 385, Primitiva 33s. 10½d., South Metropolitan 99½, 100¼. Supplementary prices, Associated Gas and Electric "A" $64½, Sheppy 5 p.ct. 61½.

The feature of the Foreign Exchange Market was the further advance in the New York rate, which closed at 4.87⅜. A slight re-action was seen in the French rate at 123.87¾; but the Belgian exchange rose to 34.88¼, and the Italian to 93.09. German reichsmarks were steady at 20.40; Spanish pesetas dropped to 34.38½; and Dutch florins were unchanged at 12.09⅜.

The Bank Rate is 6½ p.ct., to which it was raised from 5½ p.ct. on Sept. 26. The Banks' deposit rate is 4½ p.ct., and the deposit rates of the Discount Houses are 4½ p.ct. at call and 4¾ p.ct. at notice.

RECENT REVISION OF THE EDUCATION SCHEME.

By Walter Hole.

The Education Scheme of the Institution of Gas Engineers came into operation in the year 1923. The first examinations were held in 1924. Since it was launched, the Scheme has undergone three revisions. Each of these has marked a great step forward in either the scope of, or the machinery for the working of, the Scheme. The revision of 1925 was concerned principally with the inclusion of Gasfitting and the adoption of the Minor Grouped Courses in Gas-Works Practice and Gas Supply Practice. The revision of 1927 included a considerable simplification of the Courses in Gasfitting, and a process of devolution by the formation of ten District Committees. It is the purpose of the present article to describe the principal alterations made in the course of the present year's revision.

In order to visualize clearly the limited but important modifications introduced into the Education Scheme by the revision of 1929, it is necessary to bear in mind its general structure. As is well known, the Scheme consists of three distinct parts. Commencing with the lowest, there is the Gasfitter's Course, which is a craftsman's course pure and simple. There has been no alteration whatever in this.

Next in importance are the Minor Grouped Courses in Gas-Works Practice and Gas Supply Practice. These again remain unaltered by the latest revision.

The third and most important part of the Scheme consists of the Major, or Professional, Courses in Gas Engineering and Gas Supply. Each of these is divided into three grades.

Section 1 of the Major Course Scheme deals with students who are able to study the complete Course—approved by the Gas Education Committee—at some technical school or college. In this section a valuable addition has been made in the insertion (see pages 11-13 of the Regulations) of typical Courses in Gas Engineering and Gas Supply which will be of the utmost value to heads of technical colleges in drawing up schemes for the approval of the Gas Education Committee, and also to students as an indication of the kind of course to be undertaken. These are as follows:

Gas Engineering.

Ordinary Grade.

1st Year.

Practical Mathematics	S1
Physics	S1
Inorganic Chemistry (Theoretical and Practical)	S1

2nd Year.

Engineering Science	S1
Inorganic Chemistry (Theoretical and Practical)	S2
Machine Drawing	S1

3rd Year.

Inorganic Chemistry or Physical Chemistry	S3
Machine Drawing	S2
Gas Engineering (Ordinary Grade)	

Higher Grade.

4th Year.

Building Construction	S1
Engineering Science	S2
Practical Mathematics	S2

5th Year.

Heat Engines	S3
Applied Mechanics	S3
Gas Engineering (Higher Grade)	

Gas Supply.

Ordinary Grade.

1st Year

Practical Mathematics	S1
Physics	S1
Machine Drawing	S1

2nd Year.

Engineering Science	S1
Inorganic Chemistry	S1
Gas Supply (City and Guilds Standard)	

3rd Year.

Machine Drawing	S2
Engineering Science	S2
Gas Supply (Ordinary Grade)	

Higher Grade.

4th Year.

Practical Mathematics	S2
Building Construction	S1
Electrical Engineering	S1

5th Year.

Mechanics	S3
Inorganic Chemistry	S2
Gas Supply (Higher Grade)	

Note.—The symbols S1, S2, S3, are used to denote the grade of the subject studied, and signify the 1st, 2nd, and 3rd years of study of a subject in the normal senior course of a technical school—*e.g.*, Physical Chemistry S3 would denote Physical Chemistry of such a standard as is suitable to a student who has already studied chemistry for two years. Similarly, A1 and A2 denote the 4th and 5th years—*i.e.*, the 1st and 2nd years of the advanced course which follows the senior course.

There are, however, fewer than forty centres having approved Courses in the whole of the United Kingdom and Ireland. It is obvious, therefore, that there are many considerable areas untouched, and a great number of students for whom Section I. is practically useless. It has been recognized from the very inception of the Scheme that this must be so. Consequently, Section II. was devised to meet the case of students who, from geographical or other sufficient reasons, were unable to come in under Section I.

Up to the present year, the provisions of Section II. have proceeded on the assumption that, though the full Course in Gas Engineering or Gas Supply could only be taken at a certain limited number of centres; yet there are technical schools and colleges established generally throughout the country, one or other of which must be within reasonably easy reach of any potential student. Each such student, therefore, could obtain tuition in ancillary science subjects to the standard required under the Scheme. It was consequently provided that students for whom Section I. was inapplicable should attend such approved colleges, and, after receiving and profiting by instruction in a certain number of science subjects to the specified standard, they should be eligible for admission to examination in the main subjects of Gas Engineering or Gas Supply as external candidates. In such cases the student had, perforce, to rely upon private coaching and study for preparation in the two latter subjects.

These provisions may be concisely summarized as follows:

(*a*) A Section II. candidate must attend an approved technical institute for instruction in appropriate science subjects.

(*b*) The candidate must have profited by the instruction received, as shown by his examination results.

(*c*) In order to receive the necessary certification in these subjects, the candidate must have attended class teaching for a certain minimum number of times, and have received satisfactory marks for homework, class work, laboratory work, &c.

(*d*) No question was asked as to how the candidate had obtained instruction in the main subject of Gas Engineering or Gas Supply.

In other words, while external examinations in the main subjects were recognized and provided for, the student obtaining his tuition how and where he could, with no questions asked as to how it had been obtained, all ancillary subjects must have been studied in properly organized classes in technical institutes or other educational establishments approved by the Gas Education Committee. That was the position up to the present year, and must be kept in mind in attempting to appraise the alterations now introduced.

Seven years' experience of the Scheme has proved that, for a variety of reasons, these provisions are not capable of such universal application as had been anticipated. As a matter of fact, they had in many cases completely broken down. It is with these, therefore, that the recent revision has been chiefly concerned.

Stated in its simplest terms, the recent revision has introduced the principle of the recognition of external examinations in all the ancillary subjects. As far as this section is concerned, the Scheme may become one of certification only in both main and ancillary subjects. To that extent it is a complete reversal of the principle on which the Scheme has hitherto been based—namely, that examination and certification should occupy a merely secondary place. The primary object was to ensure directly that each candidate had received full and adequate class teaching of the best character available. Under the new regulations, these results are secured now indirectly, not directly. The Scheme does not now say to the student, you *must* attend suitable classes at recognized centres. What it demands is that candidates shall prove that they have attained a certain standard in ancillary subjects, as shown by examination results, without asking how or where the preliminary tuition has been obtained.

Three things therefore became necessary:

(1) To draw up a list of appropriate science subjects.

(2) To decide the minimum standard in these to be attained by the candidate in each of the grades in both Gas Engineering and Gas Supply.
(3) To arrange for the examination of the candidates in each of the ancillary subjects.

The subjects and standards are set out in clause 27, page 23 of the revised Regulations, which reads :

(27) The following is the prospectus of ancillary subjects for external students :—

—	Gas Engineering.		Gas Supply.	
	Ordinary Grade.	Higher Grade.	Ordinary Grade.	Higher Grade.
Practical Mathematics	S1	S2	S1	S2
Engineering Science	S1	..	S2	..
Mechanics	..	S3	..	S3
Heat Engines	..	S3	..	..
Machine Drawing	S2	..	S2	..
Inorganic Chemistry	S3	..	S1	S2
Physics	S1	..	S1	..
Building Construction	..	S1	..	S1
Electrical Engineering	..	..	..	S1
Gas Engineering	Ordinary	Higher	..	..
Gas Supply	..	..	Ordinary	Higher

It will be observed, therefore, that the previous more flexible arrangement by which in cases of difficulty a certain discretionary power was vested in, and exercised by, the Gas Education Committee, has been replaced by a set and predetermined programme, from which, after a limited " carry over " period, no departure will be allowed. Whether this rigid prospectus will or will not create fresh difficulties in the place of those it was formulated to overcome, experience can alone decide.

Having determined the subjects of study, the next step was to provide a means of examination in ancillary subjects for those entering under this section. Fortunately for this purpose, the country is now practically covered by one or other of the various Educational Unions of Institutes and Committees, each of which conduct examinations in the appropriate subjects to the required standard, and admit external candidates to their examinations upon payment of their fee. A list of these Educational Bodies is given in clause 17, page 20, of the revised Regulations, as follows :

(17) The examinations in the ancillary subjects will be conducted by Examining Bodies as follows or as subsequently approved or modified by the Gas Education Committee : Northern Counties Union for Northumberland, Durham, and Cumberland ; Yorkshire (West Riding) Education Committee for West Riding of Yorkshire ; East Midland Educational Union for Derby (part), Nottingham, Leicester, Northants, Lincolnshire (part), with possible extension southwards to the Thames ; Kent Education Committee for Kent ; Surrey Education Committee for Surrey ; Union of Lancashire and Cheshire Institutes for Lancashire and Cheshire, Derby (part), Westmorland, North Wales, and Isle of Man ; Union of Educational Institutes for Birmingham and all the country west of the sphere of the East Midland Educational Union and south of the sphere of the Union of Lancashire and Cheshire Institutes.

In Scotland arrangements for examinations in the ancillary subjects will be made by the Four Central Institutions, with which all the schools are affiliated.

Similar arrangements will be made for students resident outside the areas mentioned and overseas.

As each of these bodies conduct examinations in various centres within their own area, it should not be difficult for any student to submit himself for examination in one or other of these without involving himself in serious expense for travelling, or in undue loss of time.

Students who contemplate taking advantage of the foregoing arrangements should, however, bear in mind that in different parts of the country syllabuses vary somewhat. They should therefore procure the detailed syllabus of the educational body in whose area they reside, as given above, so that the preparatory studies may cover the exact ground which the examination may traverse. These syllabuses for each of the examining bodies may be obtained, on application, from the Organizing Secretary, the Institution of Gas Engineers, 28, Grosvenor Gardens, S.W. 1.

A general indication of the range of the syllabus in each of the ancillary subjects is set out on pages 52-60 of the Revised Handbook, but, owing to the variations in different parts of the country to which allusion has been made, these should be looked upon as typical, and not as precise for any centre.

It will readily be seen that the development thus briefly described has its perils as well as its advantages. These dangers affect the Technical College on the one hand and the individual student on the other. In connection with the Colleges, outside the London area the numbers attending established classes are so small that the defection of even one or two might mean the closing down of the class. They would become so far uneconomic as not to justify their continuance.

Then as to the individual. All students are strongly urged in their own interests to attend classes wherever they are available, although it may entail very considerable inconvenience and loss. The final decision, however, lies with the student. But it would be a thousand pities if the future should show that in legislating for difficult cases the Institution has opened a door for the indolent slacker. There will probably always be some few who will try to do the least, instead of the greatest, possible amount of preparatory study, who will endeavour to find the easy path and the short cut to success. It may possibly be that some misguided student may see in the present more liberal provisions of the Education Scheme an opportunity to avoid class tuition where it is really available. If so, it may fittingly be pointed out that a sure and certain Nemesis awaits all such in their failure in examinations, wasted years, and the mortifications of seeing more sensible and industrious students forging ahead in their profession.

But in the event of these obvious considerations proving an insufficient deterrent, the Scheme provides a further safeguard in Clause 21. Under this clause every external candidate qualifying for the Higher Grade Certificate in either Gas Engineering or Gas Supply must present himself for oral examination, in which his proficiency in the ancillary as well as the main subject will be tested. The mere " crammer " who " swots " to pass the written examination will be fortunate indeed if he manages to negotiate this additional hurdle.

The perplexed or doubtful student should always apply for counsel and guidance to the Secretary of the District Committee in whose area he resides. Much worry and anxiety are caused through ignorance of the educational facilities which are available. The District Committees have been formed for the express purpose of smoothing the way of the earnest student. In special cases they have been instrumental in procuring tuition where otherwise it could not have been obtained. It must always be to the advantage of the student to obtain the best instruction possible. His future career depends largely upon success in his studies. In any case of doubt, therefore, the student is advised to communicate with his District Committee before making any arrangements for commencing his course of study. The following is a list of the Chairmen and Secretaries of the District Committees :

District.	Chairman.	Secretary.
Eastern	F. Prentice	E. F. Keable, Engineer and Manager, Gas-Works, Southtown, Great Yarmouth.
Irish	J. D. Smith	G. Airth, Gas-Works, Dundalk.
Lancashire	W. J. Smith	J. Alsop, Gas-Works, Bolton.
Midland	F. C. Briggs	H. R. Hems, Gas Department, Council House, Birmingham.
North of England	C. Dru Drury	H. Lees, J.P., Gas Office, Hexham.
Scottish	Dr. T. Gray	David Fulton, Gas-Works, Helensburgh.
Southern (S.E.)	L. Trewby	T. H. Prater, Gas-Works, Margate.
Southern (S.W.)	S. Robertson	S. Hole, Gas-Works, Bath.
Wales	H. D. Madden	O. Thomas, Gas-Works, Pentre, Rhondda.
Yorkshire	J. Bridge	C. H. Chester, Gas-Works, Wakefield.

In the early stages, one of the gravest difficulties, inherent in the inception of Grouped Courses of Instruction such as this Education Scheme, is the question of exemptions. Students come in with varying degrees of preparation. It is obviously absurd to ask any student to take again any subject which has previously been satisfactorily covered. In practice this has meant that each case had to be considered separately. The uncertainties incidental to such procedure have now been removed by the publication, on pages 34-38 of the revised Regulations, of a list of recognized exemptions, which may be consulted by any student wishing to ascertain his position. It will also be an invaluable guide to the principals of technical colleges when enrolling students, and to District Committees in framing the advice offered to inquirers.

Putting all the foregoing modifications together, it must be admitted that the 1929 revision constitutes a great advance, considered either as a progressive development of the Education Scheme as such, or the clarity of the Regulations governing the Scheme, or the machinery by which it is to be administered, or the removal of difficulties which had grown very troublesome. It is hoped and, indeed, confidently anticipated, that the industry will recognize it as such ; and that the slow but healthy growth in the numbers who have already taken advantage of its provisions and opportunities will continue, with a pace accelerated by the knowledge that " the Higher Certificate or the Diploma in Gas Engineering is normally a necessary qualification for corporate membership of the Institution (of Gas Engineers), and either, or the corresponding Certificate in Gas Supply, is sufficient qualification for admission to the Institution as Associate."

GAS ACTS FOR 1929.

As was the case twelve months ago, there are only about a dozen Private Acts which require notice in our pages, as dealing specially with gas undertakings. The main proposals of these measures were set out at length in the issues of the "JOURNAL" for Jan. 2 (p. 40), Jan. 9 (pp. 93-95), Jan. 16 (pp. 159-161), Jan. 23 (pp. 210-211), Jan. 30 (pp. 272-273), and Feb. 27 (p. 617). It is proposed here to indicate some of the more important alterations that were subsequently made in them.

GAS LIGHT AND COKE COMPANY.

TRANSFER OF GRAYS AND PINNER UNDERTAKINGS.

Sanction is granted by this Act to the transfer to the Company of the undertakings of the Pinner Gas Company, Ltd., and the Grays and Tilbury Gas Company. The date of transfer is to be Jan. 1, 1930. The consideration in the case of the Grays Company is to be to each holder of "A" 10 p.ct. £10 ordinary shares, £18 10s. of ordinary stock of the Gas Light and Coke Company; and to each holder of "B" 7 p.ct. £10 ordinary shares, £13 of ordinary stock of the Gas Light and Coke Company. In the case of the Pinner Company, for each "A" 10 p.ct. £5 ordinary share, £12 10s. of ordinary stock of the Gas Light and Coke Company; and for each "B" 7 p.ct. £5 ordinary share, £8 15s. of ordinary stock of the Gas Light and Coke Company.

The Gas Light and Coke Company will continue to pay all superannuation allowances, pensions, or other periodical sums granted, or payable by, the two Companies, under any superannuation, pension, benevolent, or other similar scheme, or otherwise. In the case of any staff officer of the Companies who enters the service of the Gas Light and Coke Company and joins the superannuation fund of that Company, the Gas Light and Coke Company shall, in calculating the period of his service for the purpose of any superannuation allowance of such officer upon his retirement from the service of the Gas Light and Coke Company take into account the continuous staff service of such officer with the Grays or the Pinner Company as if it had been service with the Gas Light and Coke Company.

As from the respective dates of the reading of the indices of the meters for the December quarter of the year 1929 measuring the gas supplied to the owners or occupiers (*a*) within a radius of a mile from the Grays Gas-Works or (*b*) in the Pinner district, the charge for gas shall be a price per therm exceeding by the following respective amounts the price for the time being charged by the Gas Light and Coke Company to private consumers in the part of their district which is north of the Thames, and did not immediately before Jan. 1, 1926, form part of the limits of supply of the Brentford Gas Company. From the commencement of the March quarter of 1930 to the end of the Christmas quarter of 1932, 3·4d. For each of the nine years from the commencement of the March quarter of 1933 to the end of the Christmas quarter of 1941, an amount less by 0·2d. than the amount applicable to the preceding year. As from the respective dates of the reading of the meters for the Christmas quarter of 1941, the price to be charged for gas supplied to the Grays and Pinner consumers shall exceed by 1·4d. per therm the price for the time being charged by the Gas Light and Coke Company for gas supplied to their consumers. The following proviso has been added to the Bill as originally drafted:

Provided that (*a*) at any time after June 30, 1942, the Gas Light Company or the Middlesex County Council, or the Essex County Council, or the Ruislip-Northwood Urban District Council may, in writing, represent to the Board of Trade that, having regard to the cost to the Gas Light Company of supplying gas to the Pinner consumers or the Grays consumers (as the case may be), the differential price chargeable pursuant to this sub-section in relation to the Pinner district or the Grays district (as the case may be), should be varied in amount, or cease to be chargeable; (*b*) contemporaneously with the submission of any such representation to the Board of Trade, the party making the same shall send a copy thereof to the others of the hereinbefore mentioned parties who may be affected thereby; (*c*) the Board of Trade shall consider any such representation and any other representations with reference thereto which may be submitted to them by the said parties other than the party making the original representation, and the said Board, if satisfied that, having regard to such cost as aforesaid, it is proper so to do, and after holding such inquiry (if any) as they think fit, may make an Order to take effect as from such date or respective dates (not being earlier than the respective dates of the reading of the said indices for the Christmas quarter of 1942) as may be prescribed in the Order varying the amount of the said differential price, or providing for the discontinuance thereof, within such period and in such manner as may be prescribed by the Order.

Any Order made by the Board of Trade under this proviso shall have effect as if enacted in this Act, subject to the powers of the Board of Trade from time to time, on a like application as aforesaid, to make an Order amending any previous Order made by them under this proviso; but no application for an amending Order shall be made until after the expiration of five years from the date of any representation made under the foregoing paragraph (*a*), or from the date of any previous application for an amending Order under this paragraph.

As from the respective dates of the reading of the indices for the December quarter of the year 1929 of the meters in so much of the Grays district as is beyond the radius already referred to, the price for gas shall be a price per therm exceeding by 1·2d. the price for the time being charged by the Gas Light and Coke Company for gas supplied to the Grays and Pinner consumers. To this the following proviso has been added:

Provided that (*a*) at any time after the date when the Gas Light Company shall cease to manufacture gas at the existing gas-works of the Grays Company, the Gas Light Company or the Essex County Council may in writing represent to the Board of Trade that, having regard to the cost to the Gas Light Company of supplying gas to the Grays consumers in the said portion of the Grays district and in the remainder of that district respectively, the differential price chargeable pursuant to this sub-section should be varied in amount or cease to be chargeable; (*b*) contemporaneously with the submission of any such representation to the Board of Trade, the party making the same shall send a copy thereof to the other of the hereinbefore mentioned parties; (*c*) the Board of Trade shall consider any such representation and any other representations with reference thereto which may be submitted to them by the said party other than the party making the original representation, and the said Board, if satisfied that it is proper so to do, and after holding such inquiry (if any) as they think fit, may make an Order to take effect as from such date or respective dates as may be prescribed in the Order varying the amount of the said differential price or providing for the discontinuance thereof, within such periods and in such manner as may be prescribed by the Order.

Any Order made by the Board of Trade under this proviso shall have effect as if enacted in this Act, subject to the powers of the Board of Trade from time to time, on a like application as aforesaid, to make an Order amending any previous Order made by them under this proviso; but no application for an amending Order shall be made until after the expiration of five years from the date of any representation made under the foregoing paragraph (*a*) or from the date of any previous application for an amending Order under this paragraph.

Provision is made for compensation to Directors and Auditors, and such staff officers of the two Companies as are not taken over.

EXTENSION OF POWERS OF ENTERING PREMISES.

The following is a modification of a clause which appeared in the Bill, and to which reference was made in discussion before the Unopposed Bills Committee of the House of Commons. [See "JOURNAL," March 29, p. 872.]

The powers conferred by section 21 of the Gas-Works Clauses Act, 1871, shall extend to enable the Gas Light Company and their officers and servants to enter for any such purpose as is referred to in the said section 21, or for the purpose of installing, fixing, repairing, renewing, or replacing (at the request of the occupier) any meters, stoves, pipes, fittings, apparatus, or appliances (all of which are in this section referred to as "fittings"), any building or land in or upon which there are any fittings belonging to the Gas Light Company, or which is supplied with gas by the Gas Light Company. Provided that nothing contained in this section shall apply to any fittings or works belonging to the London and North-Eastern Railway Company, the London Midland and Scottish Railway Company, the Great Western Railway Company, or the Great Western and Great Central Railways Joint Committee, and laid or placed or intended to be laid or placed in any building (not being a dwelling-house), or land of the railway company forming part of the railway premises of the railway company.

The section referring to testing, &c., of dried gas remains as originally drafted. Various protecting clauses have been included in the Act.

[*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Act sets out the powers and objects of the Association. The unissued capital (other than loan capital), amounting to £400,000, is cancelled, and accordingly the authorized capital of the Association (other than loan capital) consists of £1,976,000, all of which has been issued and has been paid up in full, and is represented by ordinary stock of that nominal value. The Association shall have power from time to time to reduce its capital (other than loan capital) to the extent and in the manner and upon the same terms and conditions as though the Association were a company incorporated under the Companies Acts, having power under its Articles of Association to reduce its capital, save and except that the reduction

shall take effect so soon as the Court shall have confirmed the same, without the necessity of the registration of any minute. Notice in writing of any reduction of capital made pursuant to this section shall be given to every member and to every holder of a share warrant entitled under the by-laws to receive notices within twenty-one days after such confirmation.

The Association in general meeting, or the Board with the sanction of the Association in general meeting, may, from time to time, and at any time, capitalize (*a*) any sums which shall have been applied out of revenue to the extension and improvement of their works, or to any other purposes to which capital is properly applicable; or (*b*) any part of the undivided profits of the Association, standing to the credit of any of the Association's reserve funds or to the credit of the profit and loss account, or otherwise available for distribution (including any sums in the nature of accretions to capital), and provide for distribution of the sums capitalized among the members or any class of the members in such form, in such manner, and subject to such conditions as may be prescribed by the provisions of the by-laws with reference to capitalization of profits.

[*Parliamentary Agents: Messrs. Sherwood & Co.*]

NEWCASTLE-UPON-TYNE.

Basic Prices and Dividend.

Under the provisions of their previous Acts and Orders, dividends on the ordinary capital of the Company may exceed the standard rate of 3½ p.ct. per annum in respect of periods in which the price charged for gas in the City and County of Newcastle-upon-Tyne and the County Borough of Gateshead is below a standard price of 11d. per therm. Within this area the price must not exceed 12·4d. per therm. There are provisions for differential prices in other parts of the Company's limits.

The present Act specifies a calorific value of 500 B.Th.U.; and the basic prices are to be as follows: Within the City and County of Newcastle-upon-Tyne, the County Borough of Gateshead, and the Borough of Wallsend, 7·4d. per therm. Within the townships of Chester-le-Street and Pelton, 9·6d. per therm. Within the County Borough of Tynemouth and the urban district of Whitley and Monkseaton, until Dec. 31, 1930, 8·5d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 8·3d. per therm; on and from Jan. 1, 1934, 8·1d. per therm. Within the urban district of Earsdon, until Dec. 31, 1930, 9·6d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 9·4d. per therm; on and from Jan. 1, 1934, 9·2d. per therm. Within the urban district of Seaton Delaval, until Dec. 31, 1930, 10·6d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 10·4d. per therm; on and from Jan. 1, 1934, 10·2d. per therm. Within the remainder of the limits of supply—the outer area—8·9d. per therm. These prices are 0·6d. per therm less than those appearing in the original Bill. The Company may charge for gas supplied by them in the outer area a price per therm exceeding by not more than 3·6d. the price for the time being charged in the Newcastle area.

The Company may charge for gas supplied by them a price greater or less than the basic price; but, except as otherwise provided, the Company shall not declare any larger dividend on the ordinary stock than 5 p.ct. per annum. The following addition has been made to this clause:

If and whenever in any year or part of a year the price charged by the Company for gas supplied by them through ordinary meters to consumers in the Newcastle area (other than consumers in whose case the price charged under any contract entered into pursuant to section 32 of the Newcastle-upon-Tyne and Gateshead Gas Act, 1916, for gas supplied, does not include the whole of the charge for, or in respect of, such supply, or varies with the quantity supplied) exceeds 8d. per therm, the Company shall not in respect of that year, or part of a year, declare any larger dividend on any ordinary stock of the Company than a dividend at the rate of 5⅝ p.ct. per annum on the nominal amount thereof, or (in the case of ordinary stock not fully paid up) on the amount paid up thereon.

A clause in the Bill as drafted stipulating that the Company should not later than in the session of 1939 promote a Bill in Parliament proposing a revision of the basic prices fixed by this Act has had substituted for it a clause stipulating that the Company or any local authority may at any time within six months after Jan. 1, 1935, and within six months after the expiration of any subsequent period of five years, apply to the Board of Trade for a revision of all or any of the basic prices; in which case nothing in the section shall be deemed to preclude the Company from submitting that so much of any decrease in the costs and charges of, and incidental to, the production and supply of gas by the Company as may be attributable to the efficiency with which the undertaking of the Company has been carried on should not be taken into account. Neither shall anything in the section preclude the Company from promoting at any time a Bill in Parliament for altering all or any of the basic prices, or for any other purpose.

There are a number of other clauses which in the main appear in the Act as originally drafted.

[*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

POTENTIAL INVESTMENTS.

XXIV.—Bournemouth Gas and Water Company.

The Bournemouth Gas and Water Company was formed in the year 1863, registered as a Limited Company in 1864, and incorporated by Special Act in 1873, further powers being obtained between 1878 and 1928. The London Office is at 48, Copthall Avenue, E.C. 2. The statutory area for the supply of gas extends to 144 square miles, and for water 62 square miles. The towns and villages in the gas area include Bournemouth, Poole, Christchurch, New Milton, Highcliffe, Milford-on-Sea, West Moors, and Broadstone. The consumers number 45,730, and there are over 375 miles of mains.

The capital of the Company, as shown by the last accounts (December, 1928), is as follows:

Capital Stock.

	£
5 p.ct. (sliding scale) shares of £10 each	172,500
"B" ordinary shares	500,050
Preference shares	439,160
	£1,811,710
Premiums received on shares	216,466
Remaining to be issued	354,834
Total amount authorized	£1,683,010

Further premiums received, £71,454.

Loan Capital.

	£
3 p.ct. irredeemable debenture stock	50,000
4 " " " "	162,025
5 " " " "	60,000
7 " redeemable debenture stock	100,000
	£372,025
Remaining to be borrowed	480,206
	£852,231

Discount on debenture issues, £4109.

Transfer arrangements—Common form. Registration fee, any document 2s. 6d. All classes of security allowed on the same deed for one fee. The stock is transferable in multiples of £5. Spouse may not witness signature. Voting (all classes of shares), 1 vote for every share up to 10; an additional vote for every further 5 shares up to 100 shares; and an additional vote for every further 10 shares.

Accounts and dividends.—Accounts are made up to Dec. 31 and submitted in February, dividends (ordinary and preference) being paid in August and after the annual general meeting. The standard price of gas is 1s. 4½d. per therm; the present price is 8·8d. per therm and the declared calorific value 450 B.Th.U. per c.ft. The dividends on the original and new ordinary shares are subject to sliding scale—viz., ⅛d. per therm above or below the standard price = ⅛ p.ct. per annum in dividend. If the dividend on the 5 p.ct. capital is not less than 3½ p.ct., the rate on the other ordinary capital is to be 7 p.ct. If the dividend on the 5 p.ct. capital is less than 3½ p.ct., the rate on the other ordinary capital is to be 1 p.ct. less for each ½ p.ct. by which the dividend on the 5 p.ct. capital is less than 3½ p.ct., and so on in proportion for any smaller fraction comprised in the diminution below 3½ p.ct. of the dividend paid on the 5 p.ct. capital.

The following table illustrates the progress made by the Company during the past four years:

Year.	Price of Gas at Dec. 31.	Quantity Sold.	Net Capital Employed.	Gross Profit. (*a*)	Total Charge for Capital.	Rates of Dividends Paid.	Amount Carried Forward and Balance Reserve Fund.
	d.	Therms.	£	£	£	£ s. d.	£
1925	9·5	8,684,928	1,495,122	81,611	77,106	8 10 0(*b*) 7 0 0(*c*)	120,512
1926	10·6	9,279,600	1,620,781	73,855	85,423	8 10 0(*b*) 7 8 0(*c*)	110,927
1927	9·5	9,876,782	1,701,398	133,354	92,326	8 10 0(*b*) 7 0 0(*c*)	156,318
1928	9·0	10,099,942	1,805,323	109,095	95,558	8 15 0(*b*) 7 0 0(*c*)	174,957

(*a*) Including water revenue balance and after deducting income-tax, parliamentary expenses, and contribution to pension fund.
(*b*) Dividend on original shares.
(*c*) Dividend (maximum) on "B" shares.

The sales of gas have steadily increased, those for the year

1928 exceeding those for the year 1925 by over 16 p.ct.; and during the same period the carry forward and reserve fund balances have increased by £54,445.

Of the companies operating in England, this Company is the only one quoted on the stock and share list, appearing elsewhere in this number, in which the capital is in the form of shares. The shares are closely held, transactions are few, and it will be seen by the following table that there is very little variation in price:

5 P.Ct. Sliding Scale Shares of £10 Each.

Year.	Transactions.		Dividend P.Ct. per Annum.	Yield P.Ct. per Annum on the Middle Price.
	Highest.	Lowest.	£ s. d.	£ s. d.
1925	13⅛	12¼	8 10 0	6 14 0
1926	12⅝	12⅜	8 10 0	6 16 4
1927	13⅛	12⅝	8 10 0	6 12 0
1928	13¼	12⅛	8 15 0	6 15 9

The shares show a very attractive yield with the certainty of security which is not reduced by the fact that the Company supplies a large part of their area with water as well as gas. The dividend for the half-year to June, 1929, was at the rate of 9 p.ct. per annum, and at the present average quotation of 13 the yield is £6 18s. 6d. p.ct. per annum. This quotation is obviously below the real value of the shares, as is shown by comparison with the " B " ordinary shares, which, on a maximum dividend of 7 p.ct., are quoted at an average price of 12½, yielding £5 12s. only.

PORT ELIZABETH AND GRAHAMSTOWN GAS-WORKS OF THE SOUTH AFRICAN LIGHTING ASSOCIATION.

By WALTER T. DUNN, M.I.Mech.E.

Having arrived from Durban by " The Carnarvon Castle " at Port Elizabeth on July 24, the writer called at the Office of Mr. Gardner Pennington, Engineer to the South African Lighting Association, who own the gas-works at Port Elizabeth, and also at Grahamstown, which is 107 miles away. The only other gas undertakings in the Union of South Africa are at Cape Town and Johannesburg [these undertakings were dealt with respectively in the " JOURNAL," Vol. 187, pp. 400 and 622]. Mr. Gardner Pennington commenced his duties at Port Elizabeth last November, and one can see evidences of his ability and alertness in many directions.

As to the town itself, it may be said that Port Elizabeth, which is beautifully situated on Algoa Bay, is well known as the port of call for the vessels of the Union Castle Line going northward to their destination at Durban, calling at East London *en route,* and southwards to Cape Town, calling at Mossel Bay.

By rail the town is roughly equidistant from Cape Town *via* the Garden Route (665 miles) and Johannesburg (712 miles). Pretoria is 740 miles away; Bloemfontein is 450 miles, and Kimberley 485 miles away. The geographical position of the town and its other industrial advantages will account for the successful establishment of a number of manufactories, notably those of the leather industries, cement, foodstuffs, milling, fruit-canning, engineering and foundry work, metal goods, lens grinding, furniture, soaps, &c., wool, clothing, reinforced concrete, motor-cars, and tobacco. The progressive Municipality are doing all they can to encourage the building of factories. They have set aside to the north of the town, near the main railway line, large areas of ground at attractive purchase prices, which are being rapidly taken up. Among the latest, General Motors, Ltd., have bought a site on which they are just completing an immense new factory for motor-car production. This Company have recently celebrated the completion of the 25,000th Chevrolet motor-car at Port Elizabeth in exactly 37 months' work, at the original factory. The South African Lighting Association have lately finished the laying of a 6-in. Stanton spun main to the new factory. Not only will gas be required there for industrial purposes, but a residential district close by, which is quickly developing, will be served.

Special reference should be made to the boot and shoe industry. To such a position has it been advanced that the town is becoming known as the " Northampton " of South Africa. It is anticipated that all the needs of the Union will soon be met by the Port Elizabeth factories. Gas is being utilized in them wherever possible. The well-equipped Technical College, which was opened two years ago, contains a complete installation of boot and shoe machinery for the instruction of the apprentices to the trade.

Some idea of the potentiality for gas development may be obtained from the last published figures relating to the population of the town. The total, including the immediate district, is 74,774, of whom 36,000 are Europeans. There are about 4000 consumers in connection with the two gas-works of the Association at Port Elizabeth and Grahamstown.

Gas at Port Elizabeth is used principally for industrial appliances; for heating; and for domestic cooking. The pressure is regularly maintained at 4 in. water-gauge. Its calorific value is 450 B.Th.U. per c.ft. There is a Boys non-recording calorimeter in the laboratory for testing at regular intervals, and recorders are fitted showing the pressures on the district. The price charged is 9s. 7d. per 1000 c.ft., with certain discounts to large users. The rate of consumption is practically constant throughout each day all the year round. The annual make is 60 million c.ft.

Coal (washed) is obtained from the Durban Navigation Collieries. Heavy railway charges are a serious item in the cost. From the State Railway, which runs parallel to the gas-works, which are built on a site overlooking the bay, the coal has to be carted across an intervening main road. Until comparatively recently, it was possible for the railway wagons (40 tons capacity) to be unloaded directly opposite to the works, but the Port Authority has commenced the second breakwater arm of the harbour construction works at that point. There is therefore a longer distance to be traversed in unloading the coal.

There are now thirteen benches of single-ended regenerative retorts, hand charged; five containing seven retorts each, and eight having six retorts each. They are of Messrs. Gibbons Bros., of Dudley, manufacture. Three column-guided holders are provided, one of 200,000 c.ft. capacity, and the other two of 50,000 c.ft. each. These were made by Messrs. C. & W. Walker. The exhausters, of which there are two (one as reserve), are of the Donkin type, steam driven.

Steam required on the works is derived from a Lancashire boiler (there being also one in reserve). Tar is economically dehydrated in a special plant which has been devised by Mr. Pennington, and has a ready sale to the Municipality of Port Elizabeth, to the Tramway Company, and other buyers. Coke is in such demand that, on occasion, supplies have to be bought outside in order to carry out contracts which have been entered into. It sells round about 36s. per ton, and is used principally by bakers; for steam raising; and by domestic consumers. The sulphate plant is no longer in operation, conditions having changed since its installation to such an extent that there is now no call for the product.

The Association are using a plant whereby the gas is compressed to 20 lbs. per sq. in., and passing into the mains carries with it a finely divided spray of paraffin. Naphthalene troubles, which were causing annoyance, have been thereby satisfactorily overcome, as is well shown by the striking diminution of complaints from consumers since the scheme was brought into operation.

The writer left the Port Elizabeth Works of the Association with the conviction that Mr. Gardner Pennington is carrying out his duties with a determination to increase the business which is within the capacity of the resources of the Association. His British colleagues will wish him the fullest possible success in his work.

Benzene-Pressure Extraction of Coal.—This was the subject of a paper by J. D. Davis and D. A. Reynolds, of the U.S. Bureau of Mines, before the Division of Gas and Fuel Chemistry of the American Chemical Society. The authors have repeated their previous investigation of the caking and swelling constituents of coal, having extended their study to a wider range of coals. Their previous conclusion that solid bitumen is more strongly caking than oily bitumen has been verified. The solidity of the benzene-pressure extract increases on continued extraction because of a concomitant increase in its solid bitumen content. A third bitumen, having both caking and swelling properties, was found in each of the coals studied. This bitumen is soluble in hot benzene, and precipitates as its solution is cooled. Removal of soluble substance with either pyridine or benzene under pressure may cause either an increase or a decrease in the swelling propensity of a coal, depending upon the character of the coal thus extracted. The unreliability of the Muck volatile matter determination as a means of testing the coking power of coal is emphasized.

MEDIUM-TEMPERATURE CARBONIZATION.

By S. W. Parr, of the University of Illinois, Urbana, Ill.

[Extract of a Paper before the American Gas Association.]

Between the high-temperature coking range of 1900° Fahr. and the low-temperature range of 900° Fahr. is a zone of carbonization midway—(say) at 1400° Fahr. Only one project makes specific use of this temperature, and that is the one developed at the University of Illinois. The fundamental objective in the working out of that method was to secure a yield of gas that would be attractive to the gas maker and at the same time produce a coke, especially from Illinois coals, that would be readily saleable in the domestic market or directly available for complete gasification or for power purposes. By maintaining the flue temperatures of a standard oven at the usual range —(say) 2000° to 2200° Fahr.—a heat cycle may be maintained within the oven in this fashion:

By charging the oven with fresh coal heated to 500° or 550° Fahr., the mass will have attained a temperature at the end of the carbonization period—(say) five hours—of 1400° Fahr., at which time the coke is dropped or pushed, a fresh charge at 500° Fahr. added, and the cycle repeated.

Has there anything developed in this world-wide experimentation on carbonization—any fundamental features of the problem—which may contribute in a practical way to better practice or improved methods in the art? It must be confessed that from a scientific standpoint the results are distressingly meagre. It is pretty largely the old story over again of cut and try first, and find the theory afterward. It is perhaps even now premature to try to find any existing fragments of theory.

Coke made at 1000° C. ignites or burns at temperatures above 600° C. (1100° Fahr.), a good red heat. If the temperature falls below this point, the reaction ceases—or, as we say, the fire goes out. If, however, the carbonization is effected at 500° C. (900° Fahr.), the ignition temperature is so low (150° C.) that, if such material is discharged into the air hot—that is, only 50° above steam temperature—the char will ignite spontaneously.

By carbonizing at 600°, 700°, 800°, and 900° C., respectively, a progressive increase in ignition temperatures occurs. But at a point midway between the extremely low and extremely high carbonization temperature there is a sharp break in the line, which seems to designate a zone where we may escape the perils of spontaneous combustion on the one hand and the need of maintaining strong combustion and high temperatures in the fire bed on the other.

Is there anything in this for the gas man? Addressing ourselves, for the moment, to the low-temperature range of carbonization, one is impressed with the magnitude and expense of the attempts made in the last 25 years. It is estimated that investments in England have exceeded $40,000,000 and that expenditures in this country have been at least half that sum in addition. From this viewpoint it would seem that we might answer the question at once in the affirmative and say there certainly must be something in it, unless possibly such an answer might be given a meaning similar to a remark of an old neighbour who had for some years operated a threshing machine. He said he knew there was money in it, for he had never been able to get any out. This must not be interpreted to mean that I am wholly pessimistic regarding the low-temperature carbonization of coal. It is inevitable that there must be lean years of experimentation and development before any large and revolutionary process can find its place in the industrial world. Nevertheless, the most beautiful of theories must sooner or later be subjected to a critical economic analysis. Such an analysis would seem to be in order at this time, but it is not considered the province of this paper to make it, except in so far as it may aid in answering the main question, "Is there anything in it for the gas man?"

Types of coal have much to do with any specific process. That which may work well on German or English coals may be wholly unsuited for any or for most American coals. Environment should be given very careful study. Germany and England need oil and lubricants; and these bye-products in those countries afford a medium of profit unknown in this country, where such material, at least for the present, is available in extravagant quantities. There can be no justification in assigning European values to those bye-products which, when made in this country, must come into competition with similar material at greatly diminished prices. Tars over there which may have a high potential value for motor spirit and lubricants can here be rated scarcely above their price as fuel oil.

Similarly, creosoting material, at one time deficient in amount in this country, is now, owing to the great expansion in bye-product oven practice, available in such abundance that the best type of crude tar for the production of creosote oils can command but a small advance over the value of the raw material as a heating medium—such advance being directly contingent upon the type and quantity of the tar acids present.

There has been a tendency also to base estimates on a fancy price for domestic fuel, such as that commanded (say) for anthracite. But the domestic market especially demands more and more a careful preparation of its fuel, and this in turn results in a larger and larger percentage of fines and low-grade material which must be sold at a loss. It is manifestly difficult or impossible to sell a fuel at $15 per ton, no matter how attractive, when in the same market a good fuel, though dirt and smudge producing, can be had for $5 per ton. Much might be expected also from an attractive appearance and good performance of a new type of fuel, and perhaps capitalization might be made of the prejudice against coke as fuel. But the coke maker has learned how to prepare his product and meet the idiosyncrasies of the house furnace, not to mention the householder. Incidentally, in passing, the coke maker has been a little slow in appreciating that a coke with a high ignition temperature would protect and hold its higher heat of ignition if in smaller sizes; where also the interspaces, while serving as conduits for oxygen, would have a high ratio of reacting surface to air, instead of serving as cooling channels for excess air with a low ratio of surface to air, as is obviously the case with coke in the larger or lump sizes.

These considerations would seem to limit us to gas as the main prospect for revenue, admitting, as we must, that fuel in the gaseous form is the most valuable and efficient, and is consequently worth more per thermal unit than in any other form. It would seem to be a fair question to raise, therefore, as to whether any of the distinctively low-temperature processes has this essential factor in sufficient quantity to attract the gas-maker, unless the gas yield is up to an equivalent of, let us say, 5000 or 6000 c.ft. per ton—that is, substantially one-half of the yield to which he is ordinarily accustomed. This, to the gas-maker, will seem, at first thought, absurdly low. But I am by no means willing at this point to allow the gas maker to lose interest. Let us make a few generalizations.

It must not be inferred from the adverse statements attending the discussion that the various processes are without merit. On the contrary, there are valuable features included with each type. Indeed, one cannot have followed the investigations of recent years without being profoundly impressed by the wealth of experimental data and the real progress that has been made in both our knowledge and practice of the art of coal carbonization. There has been a marked expansion in the domestic field of processed or artificial fuels, especially for cooking and space heating. This departure from the use of raw coal is impressive, but, even so, it is only a beginning. This trend has been stimulated by such factors as the advent into the domestic field of natural gas, artificial gas for cooking and later for heating, fuel oil, and solid fuels of the smokeless type, there being a distinct trend throughout towards house fuel in the gas form.

Is it not possible to process coal for the combined purpose of producing gas and power as a unit interest? This at once brings forward these two activities into new relationships, whether considered from the standpoint of each in its own sphere or from their combined outlook. Gas as a fuel has a form value very different and markedly greater than that of coal; hence, the logical and obvious question arises as to the economic possibility of segregating the gas and replacing raw coal for the generation of power with a bye-product from the manufacture of gas. Moreover, since gas and power as commodities are coming to be more and more united in their commercial or organized relationships, the desirability of this common viewpoint is accentuated. In short, the theory and logic of the situation are positively along the lines of more closely associated interests.

As a further illustration, the production of electricity by Public Utility Power Plants in 1928 consumed 41,336,000 short tons of coal. If the equivalent in solid fuel in processed form had been used, it would have come from the processing of 70 million tons of raw coal. That amount of coal would yield at a conservative estimate of 6000 c.ft. per ton, 420,000 million c.ft. of gas. The total gas manufactured by the utilities in the form of both coal gas and carburetted water gas for 1928 was 320,000 millions, leaving a surplus of 100,000 millions for doing the work and for growth and expansion. In general, also, these ratios of gas and power correspond to values substantially equivalent to those in any large centre where natural gas is not a factor.

The production of coal gas has increased since 1926 by 20 p.ct. Gas companies have learned that they must look at least five years ahead in their plans for the future. This is a more obvious need now than ever before. In spite of the great petroleum supply, it is offset by an expanding use of gasoline, more com-

plete cracking processes, and an increasing demand for fuel oil, with the attending prospect that oil for the carburetting of water gas must take the fag end of what is left.

I have only one further observation. Reference has been made to a mid-temperature range of carbonization. I believe it has the essential features for processing coal in such a way as to fulfil the needs of the gas maker and at the same time serve the power station with an attractive fuel. The gas yield comes well within the limits set for that product. There would be a flexibility in operation and an improved economic outlook because of this inherent relationship.

I believe that the mid-temperature range of carbonization, especially when joined in co-operation with the power plant, opens up new possibilities in the gas field. Of course, the old-time coke maker says it cannot be done, and that the product, so far as coke is concerned, would be of uncertain value.

Permit me to make one observation in closing. If this centralized viewpoint of the gas and power interests were only the imaginings of the theoretical mind or emanated solely from the laboratory of the experimenter, it might have little standing or receive only passing consideration from the practical or operating side of the industry. May I say, however, that this general idea in its original inception has already been advanced by at least one of our greatest executives actively concerned in allied gas and power interests, whose standing as a leader in the public utility field must be ascribed in no small measure to his wisdom and insight into the fundamental bearing and real significance of the very wide range of problems involved.

From that standpoint, therefore, as well as from the experimental data presented, I believe I am justified in answering the question proposed at the outset. "There certainly is something in it for the gas man—at least to think about."

ROAD TAR PROPAGANDA IN BRAZIL.

We may be apt to think that the campaign for the extended use of tar in the construction of roads is confined to this country and to our immediate neighbours, and it is with pleasurable surprise, therefore, that we find the August number of "Light," the house organ of the Rio de Janeiro Tramway, Light, and Power Company, which we have just received, devoted largely to the activities of the Gas Company in Rio in the development of the use of road tar in Brazil.

We understand from the early pages of the magazine that a Pan-American Highway Congress was held in Rio during the month of August, under the official auspices of the Governments of the various countries of both North and South America, at which matters affecting the technique of highway construction and operation were discussed on a continent-wide basis, and the opportunity for publicity work was therefore exceptionally good.

In addition to a brief résumé of a thesis on the use of road-tar in highway construction, presented to the Congress by Mr. C. H. Carder, the Chief Engineer of the Rio Gas Company, the magazine under review contains a further article from his pen on "Modern Roads," in which, while full justice is done to the merits of other systems of modern road construction, the claims of prepared tar for use in penetration macadam or tar-macadam work are emphasized, and effective use is made of figures, already published in our columns, showing the development of the use of this material in France and at home.

A report by Dr. Marcello Taylor Carneiro de Mendonça, one of the Engineers of the Gas Company, on demonstration work carried out in Curityba, the capital of the State of Paraná, at 3150 ft. altitude, makes very interesting reading. Full construction details and costs are given for 1000 sq. yards of tar-macadam and 2300 sq. yards of penetration macadam which were laid with apparently very satisfactory results, even though temperature changes in early April ranged from 46° Fahr. at 7 a.m. to 100° Fahr. at midday.

The principles of tar distillation, and particularly the preparation of road tar to standard formulæ, are described in a well-written article by Mr. O. Allan, the Works Superintendent of the Rio Works, and illustrated by views of the plant.

Further interésting photographs, including some of tar-macadam road construction in the City of Rio de Janeiro, attract the interest of the reader and help to make up a most interesting number, sixteen pages of which, on art paper of the same size as our own issue, are devoted to the subject of road tar.

The following are extracts from the articles:

MODERN ROADS.

By C. H. Carder, Chief Engineer of the Rio Gas Company.

Modern traffic conditions, both urban and inter-urban, call for a well-planned and well-built system of highways to stand up to the ever-increasing volume of automobile and motor lorry traffic which they now have to carry; and the old system of construction, which were perfectly suitable for slow moving animal traffic, can no longer be considered satisfactory.

A modern road, besides being well planned, with its curves and gradients suitable for the requirements of heavy and fast moving traffic, should be homogeneous in construction, and have a smooth, resistent, and dust free surface. Ordinary waterbound macadam does not satisfy these requirements, and we have therefore to choose either a concrete (simple or reinforced) or a bituminous construction to give the results desired.

Concrete roads have the advantage of uniformity of composition and hardness of surface, and are easy to build. They suffer, however, from the disadvantage of being very costly, and the concrete changes in dimensions with changes in temperature and humidity, causing cracks which permit water to get into the subsoil, with consequent displacement of the concrete. In bright sunshine, also, the reflection of light from the surface of such a road is very objectionable, and makes driving difficult. Painting the surface of the road with a bitumastic solution, such as liquid asphalt or road tar, is a great improvement on the plain concrete road, giving a waterproof surface of dull tone, which not only preserves the road, but also prevents glare.

For the construction of roads with broken stone and bituminous material, we can choose between two generic types of material and various methods of construction and finish. The bituminous material may be either a petroleum product—the so-called asphalts—or a prepared tar obtained from the distillation of coal. There are many points of similarity between the two materials, and properly treated either of them is capable of giving perfectly satisfactory results. The use of asphalt for various types of paving is already well known here; and has been used for many years with great advantage in asphaltic carpet and bituminous macadam work.

The use of tar preparations—road tar, dehydrated tar, and pitch—is at present very limited in Brazil, but the employment of these materials in European countries has shown enormous progress in recent years. The best-known formulæ for the preparation of this material originated in England, where the question has been carefully studied for more than a quarter of a century; and, after making their own investigations, other European countries have adopted the same formulæ.

In France, the production of tar in 1928 was approximately 516,000 tons, of which 239,000 tons was used in road work. Even so, 44,000 tons of tar was purchased from Germany in that year, for use on French roads.

In England, the consumption of tar for roads purposes rose from 450,000 tons in 1923 to 700,000 tons in 1927, and it continues to rise; while the consumption of asphalt in the same time has remained stationary, the importations being 262,871 tons in 1923 and 260,640 tons in 1927.

For the construction or complete reconstruction of highways in England at the present time the most favoured system is that of tarmacadam, where all the stone is hot coated with prepared road tar before being spread. The rebuilding of old water-bound macadam roads is also carried out with a single layer of tarmacadam about 3 in. thick, or with penetration macadam. Under this latter system, after the old road surface has been scarified, the new wearing surface is formed up with dry stone lightly rolled into place, and hot road tar run over the surface from tank wagons. Stone chips are then lightly scattered over the surface, and the whole surface heavily rolled.

Even in country districts in England, it is not now considered good practice to leave any water-bound macadam road, either new or repaired, without at least painting the surface with road tar or other similar material. This procedure has several advantages: First, it enables the roads engineer to check up the materials used in the works, and ensures that sand or crushed stone is employed as a binder, since the tar will not adhere to mud or clay; secondly, the tar serves to bind the surface of the road together, and prevents ravelling; thirdly, as the surface of the road is waterproofed, water cannot get into it and cause its complete breakdown; fourthly, the surface of the road is kept clean with free drainage for storm water; fifthly, the street does not form dust from its own proper disintegration under the wheels of traffic or the hoofs of animals.

Annual painting with road tar or similar material over the full or part width of the road, according to traffic conditions, is exceedingly cheap, and contributes largely to the longer life and upkeep of the road. It is ordinarily applied in England to both macadam and tarmacadam roads, and the figures prepared by the City Surveyor of Deptford, with reference to the work carried out there during 1926, showed that the average cost of the surface treated in that year worked out at 2·16d. per sq. yard, including transport and all repairs to machinery, &c.

Here in Brazil, road tar and the tarmacadam system of road building were first put forward last year, in a short stretch of road built by the Gas Company in the Second Automobile and Roads Exhibition held under the auspices of the Automobile Club. Some months later, in the City of Rio de Janeiro, a length of the Rua dos Ourives was paved by this system, as a practical test of its suitability for heavy traffic conditions of both motor lorry and horse-drawn vehicles, with very satisfactory results. At the same time, another stretch of the same street was paved with penetration macadam, and a third stretch with bituminous carpet over crushed stone base, both with road tar prepared by the Gas Company here, also with very encouraging results. During the current year, the city authorities of Curityba, the capital of the State of Paraná, have carried out 1000 sq. yards of tarmacadam and 2300 sq. yards of penetration macadam paving, using road tar prepared by the Rio Gas Company and a very dense local granite.

The technique of the use of this material is easily acquired by engineers already accustomed to road work; and, though it is relatively a new thing here, the advantages which it offers, as shown by its wide acceptance in Europe, are a sufficient guarantee that if will be seriously considered by the roads engineers as a national material which is eminently suitable for the construction both of city streets and also of the highways which, radiating in all directions, will contribute so largely to the development of this country.

RESULTS OBTAINED WITH ROAD-TAR IN THE PAVING OF CURITYBA.

(Report of Dr. MARCELLO TAYLOR CARNEIRO DE MENDONCA, of the Rio Gas Company Engineering Staff.)

Experience shows that road tar for use in any particular case must follow specifications prepared in accordance with the conditions of locality and climate where the material is to be used. For this reason, after determining and establishing the specifications for the northern part of Brazil, in Rio de Janeiro, we carried out in Curityba, capital of the State of Paraná, demonstrations of two types of tar paving in accordance with specifications drawn up by the Chief Engineer of the Company.

Curityba, the capital of the State of Paraná, is in the hills, at 3150 ft. above sea level. Rains are frequent, and, during the current year, from January to July, changes of temperature have been severe. We carried out two types of paving in some of the most heavily trafficked streets in the town, constructing altogether 950 sq. m. (1026 sq. yds.) of paving in tarmacadam, and 2100 sq. m. (2268 sq. yds.) of paving in penetration macadam. The technique of this work was as follows:

On a vacant plot of ground in Rua Mauricy, we erected a temporary plant consisting of deposit of graded stone; arrangement for drying the stone (two iron plates of 10 sq. ft. in area on brick columns); petrol engine driven concrete mixer of 5 cwt. capacity per charge; and empty steel drums for heating the road-tar.

The stone used was a very hard local granite, of 2·45 density. It was thoroughly dried on the rough furnace, using wood fuel, and then allowed to cool to a temperature between 30° and 50° C. before being coated with tar. The latter was used in the proportion of 4 p.ct. by weight of the stone—approximately 10 kilos for each charge of the concrete mixer—at a temperature of 60° to 75° C.; and complete mixing was effected in 3 minutes for each charge. The heaviest roller available was of 7 tons only, and we had to do the best we could with this, though a 12-ton roller should really have been employed with such dense stone, especially for the under bed.

Over a well-rolled base of dry stone 4 in. thick we laid the first coat of tarmacadam approximately 2 in. thick, with stone 1¼ in. to 2 in. in size, rolling this only sufficiently to bed the stone. The stone used for the second layer of tarmacadam consisted of one-third of stone of 1¼ in. to 2 in. in size, and two-thirds of stone ⅜ in. to 1¼ in. This was coated in the same manner as the stone for the first coat, and, after being spread, was allowed to cool before being again lightly rolled into place. It was then covered with just sufficient tar-coated fine stone to fill any surface voids; this fine stone being coated at 50° C. with 8 p.ct. by weight of tar at 75° C. The whole was then heavily rolled until a firm and uniform surface was obtained, the total thickness of the finished tarmacadam being 4 in.

About twenty days after the road had been open to traffic, the final surface painting was carried out, a bright and sunny day being chosen for this purpose. The road surface was well brushed with hard brooms to remove all dust, and lightly sprayed with road tar at 140° C., well brushed out, and lightly covered with fine granite chips mixed with a very small proportion of cement. The roller was passed over it (once only), and the road then finally opened to traffic.

The surface was of a dark grey colour, firm, and smooth, but with sufficient roughness to give good adhesion for motor traffic. During the execution of this pavement we were not able to close the road at all, since on the stretch being paved there are three garages where a large number of cars and motor lorries are stored, as well as two public petrol supply pumps (filling stations). This street also carries a considerable amount of horse-drawn traffic, on narrow steel tyres.

PENETRATION MACADAM.

Over a well-rolled and properly formed dry stone base, 1½ in. to 2 in. stone was spread to a depth of 4 in., and a sufficient amount of ¾-in. stone spread over this to give a proper surface. After very light rolling, road tar at a temperature of 80° C. was run over this at the rate of 6½ litres per sq. m. (1½ gallons per sq. yard). After allowing time for this to penetrate between the stones, the road was heavily rolled. Any slight irregularities were filled in with pre-tarred granite chips (8 p.ct. tar) similar to those used for the surface coat of the tarmacadam road, and the whole was then firmly rolled; a light dressing of clean sand being used for the final finish.

Owing to lack of precise figures from the municipal authorities, we were not able to get the exact cost of the tarmacadam work. These costs included the scarifying of the whole of the re-paved areas, largely done by manual labour, as well as all the stone needed for the dry stone underbed. Further, the work was interrupted several times by causes entirely outside our control; and for these reasons we cannot determine accurately what the cost of the tarmacadam work was, but estimate it at approximately 28 milreis (14s.) per sq. m. (11s. 10½d. per sq. yard).

Penetration macadam costs for the 1600 sq. m. of paving in Rua Mauricy worked out at 2s. 9d. per sq. yd., after allowing 20 p.ct. of the cost of the job to cover depreciation of plant and equipment.

The final appearance of this pavement and the results obtained from it are very satisfactory. It stands up well under traffic both of heavy lorries and of narrow tyred carts, and, owing to the homogeneity of its construction, resists disintegration either from traffic or from weather.

The success of any paving work carried out with road tar, as with any other type of bituminous material, depends on the care exercised in its execution and scrupulous observance of the rules governing its use. For this reason, it is worth while to emphasize that surface painting with road tar should be carried out in fine weather, as to surface tar a wet road is a waste of time and money, as also is it to try to prepare tarmacadam with wet stone or to run hot tar on to wet stone for a penetration macadam road.

SILOCEL INSULATION.

The Celite Products Corporation, of 91, Windsor House, Victoria Street, S.W. 1, have published an interesting booklet bearing the title "The Logic of Insulation." In this it is pointed out that the only effective method of reducing heat losses through walls is to "blanket" the equipment with a layer of insulating material outside of the refractory. Generally speaking, a material having a low apparent density is considered a good insulator. Most of such materials contain a number of small "voids" or cells containing air. Should these air cells be too large, however, radiation across the air spaces and convection currents within the cells will increase the apparent conductivity and lessen the value of the material as an insulator.

"Silocel" brick, it is stated, averages about ten times as effective in retarding the passage of heat as refractories. This low conductivity is due to the fact that "Silocel" contains a volume of as much as 85 p.ct. of very minute air cells. In fact, there are approximately 40 billion of these cells in each cubic foot of the natural mineral "Celite," from which "Silocel" is made.

The booklet goes on to say that "Silocel" insulation built into the walls, tops, and bases of heated equipment (or installed as an exterior course on walls and over tops) reduces the heat radiation loss 60 to 90 p.ct., depending upon the thickness of the insulation and the type of construction. This heat saving does not necessarily mean the securing of a higher temperature in the equipment. It can be applied as readily toward maintaining uniformly the desired operating temperature with less fuel.

Besides fuel saving, other advantages of insulated construction are more uniform heat distribution, easier control of temperatures, quicker heats, and increased capacity of the equipment. Fuel savings resulting from the use of "Silocel" vary, of course, with the type of equipment in which the insulation is employed. In general, the entire cost of "Silocel" insulation is repaid by fuel savings alone during its first year of service. In some cases the cost is repaid in a much shorter time. Since "Silocel" is permanent, savings continue year after year throughout the life of the equipment.

Institution of Chemical Engineers.—The annual President's Reception will take place on Wednesday, Nov. 6, at the New Princes' Galleries, Piccadilly, London, W. 1. Invitations will be issued shortly.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Address by Mr. C. S. Shapley.

The Twenty-Sixth Annual Meeting of the Yorkshire Junior Gas Association took place on Oct. 19, in the Lecture Room of the Fuel Department at Leeds University—Mr. S. H. Packer, of Bradford, the retiring President, in the Chair.

The President, in opening the proceedings, welcomed the presence of Mr. C. S. Shapley, the Leeds City Gas Engineer and General Manager, and President of the Institution of Gas Engineers; Mr. W. B. McLusky, the Halifax Borough Gas Engineer and General Manager, and President of the Manchester District Institution of Gas Engineers; and Mr. H. C. Appleby, President of the Manchester District Junior Gas Association.

The annual report, presented by Mr. R. Crowther (Hon. Secretary), stated that the membership of the Association was now 194—a net increase of six on the previous year. In connection with the Education Scheme, eleven new centres had been formed where tuition could be obtained in gas subjects; and if students in other areas would come forward, further classes could be provided.

The statement of accounts for the year showed a credit balance of £96, as compared with £104 at the end of last year. There were, however, a number of outstanding subscriptions.

The report and accounts were adopted, on the motion of Mr. F. Murphy (Barnsley), seconded by Mr. J. W. Carlton (Bradford).

On the motion of Mr. J. W. Holroyd (Elland), seconded by Mr. J. W. Horwill (Bradford), the meeting agreed to send to Mr. C. T. B. Roper, of Bradford, a letter of sincere regret at his recent renewal of illness, and hopes for an early and complete recovery.

New Officers.

The following were elected to office in the Association for the coming working year:

President.—Mr. Fred Firth, Leeds.
Vice-Presidents.—Mr. J. W. Horwill, Bradford; and Mr. J. W. Holroyd, Elland.
Hon. Treasurer.—Mr. H. E. Wilde, Bradford.
Hon. Secretary.—Mr. R. Crowther, Elland.
Assistant Hon. Secretary.—Mr. J. R. Firth, Bradford.
Council.—Messrs. C. H. Chester (Wakefield), R. Halkett, Junr. (Sheffield), W. I. Ineson (Bradford), F. J. Jackson (Sheffield), F. Murphy (Barnsley), J. W. Wood (Leeds)—to be added to Messrs. R. N. Webb (Leeds), J. W. Carlton (Bradford), S. T. S. Musgrove (Sheffield), who were in office from a previous election, and Mr. S. H. Packer (Bradford), *ex officio* as immediate Past-President.
Representatives on District Education Committee.—Messrs. C. H. Chester J. W. Horwill, R. N. Webb, and A. Wyllie (Sheffield), the three former being re-elected and the latter being appointed in the place of Mr. C. T. B. Roper, owing to Mr. Roper's ill-health.
Hon. Auditors.—Messrs. A. W. Arnold (Bradford) and F. Lodge (Wakefield).

The New President.

Mr. Packer, introducing the new President, remarked that Mr. Firth had given many years of valuable service to the Association, both on the Council and in other ways. Mr. Packer said he knew of nobody who was more worthy of being the President of the Yorkshire Junior Gas Association than Mr. Firth, who was an able member of the efficient staff which Mr. C. S. Shapley had in the Leeds Gas Department.

Mr. Firth, taking office, said that, on looking back over the list of Past-Presidents of the Association, he found many names of men who had reached eminence in the gas profession. It would be his endeavour to follow the example of their work.

Mr. Firth then presented to Mr. Packer the Association's gold medallion, as a mark of appreciation of services rendered in the Chair.

Mr. Packer, responding to the presentation, said he had had a delightful year of office. He entered it with enthusiasm, and had enjoyed every minute of it. The work in itself was an experience well worth having, and he thanked the members generally for the encouragement they had given him.

On the motion of Mr. D. T. Livesey (Doncaster), seconded by Mr. A. Wyllie (Sheffield), a vote of thanks was passed to the retiring President, Officers, and members of Council.

Mr. Packer and Mr. H. E. Wilde (Hon. Treasurer) briefly responded.

The President then introduced Mr. Shapley, who had kindly undertaken to give the meeting a short address. His zeal and interest on behalf of the Juniors were well-known in the industry, and needed no emphasis. He was a man of very little leisure at any time, and very much less so now that he was President of the Institution; and it was a very real favour that he should be able to spare time to come to address the Juniors at the opening of their new session. Mr. Firth said he took it as a very great compliment to himself, as one of Mr. Shapley's staff, that the Institution President should be with them that day. [Applause.] The fact that a thousand of the staff and workpeople of the Leeds Gas Department had, a few days ago, presented to Mr. Shapley an illuminated address containing all their names, to mark their appreciation of his election to the Presidency of the Institution, showed how highly he was appreciated and esteemed within Leeds by the people among whom he worked and with whom he came most directly in touch. [Applause.]

Address

By C. S. Shapley, President of the Institution of Gas Engineers.

Mr. Shapley said he wished to refer briefly to the responsibilities of the Institution, of the Junior Associations, and of the rank and file members to the gas industry in a time of severe trial. To say something new, to one who had had to do a good deal of speaking in the industry lately, was rather difficult; and he recognized that he had undertaken a big task when he promised to visit, during his year of office, each Senior District Association and as many as possible of the Junior Associations. He had already, that week, spent about 25 hours in work for the industry as apart from his own immediate work at Leeds. Mr. Shapley said he had been very deeply touched by the recent presentation from his own staff and workmen. It was not always in these days that a chief got a tribute like that—unless he happened to be leaving. [Laughter.] Mr. Shapley said he was very glad the Juniors in the gas industry stuck to the name "Association" for their organizations, instead of attempting to call it anything in the way of a Junior Institution. "Institution" meant a great deal in the industry, particularly now that they had the Royal Charter and the examinations for qualification for membership. They must keep the word "Institution" for the national technical body, membership of which was open only to those who had studied and worked hard to attain it.

In thinking over the lustre that the Juniors were going to add to the industry by their efforts in passing examinations to be able to call themselves members of the Chartered Institution, there were many things of which to be glad. The Institution had moved a good deal during the past year. It was having an intermediate meeting for the sole purpose of discussing research work and the reports of the research authorities. He believed this was an important step in the right direction, and one which would be fully appreciated by the research workers in the future, who would know that their reports would really receive the most careful consideration. The Institution had, for instance, already come to some valuable conclusions in regard to ammonia.

In regard to the work of the Institution, if anybody thought it was an easy job to be on the Council of the Institution they could disabuse their minds at once. Mr. Shapley said that, if anybody doubted it, let them turn for confirmation to Mr. W. B. McLusky, of Halifax, who was quite a young member of the Council, but who had no doubt already realized something of the responsibilities involved. In regard to the Institution Presidency, Mr. Shapley said he had on a former occasion expressed his regret that that high office had not been really open to any but the few who happened to be associated with an undertaking whose controlling committee or directors would entertain a large body like the Institution. He was proud to know that, so far as he himself was concerned, the Leeds City Council had unanimously approved his acceptance of the Institution Presidency, with whatever obligations it might involve, but he was, nevertheless, extremely glad that in June last he had succeeded in getting a resolution through, as a result of which the Presidency of the Institution was open to any member. He did not see any particular reason why it should not come to Yorkshire again soon, but it involved a lot of hard work on the Council by the man who had any hope of attaining that high office. Mr. Shapley said he wished to pay tribute to the Manchester District Institution, but for whose action in re-electing him their President for the second year he would probably not have been on the Institution's Council when the offer of the Presidency came; and therefore he was anxious to say at once that he felt he owed a good deal to the Manchester District Institution.

Competition.

The work undoubtedly involved the sacrifice of a great deal of personal time, and especially so for one living and working a couple of hundred miles away from London. The Institution, said Mr. Shapley, could be depended upon to keep the flag of the gas industry flying, despite the anxieties and difficulties and

growing competition of present days. It was for the Juniors, on their part, to keep the flag flying in their own particular sphere. Competition which had to be faced by the gas industry had been greatly increased by the Government's boosting of electricity, by free wiring, and by the sensational Daily Press which seemed to love giving the widest possible publicity to every case in which some unfortunate individual deliberately chose to put his or her head into a gas oven. All this kind of thing was grossly unfair to the gas industry, but it seemed to be a difficulty which the industry had to face whether it liked it or not; and it was for all concerned in the industry, from chief gas engineers to the humblest man on the works, to add yet more to the efforts they had made in the past to maintain a first-class public service.

Coal Prices.

The industry was now faced also by the coalowners, who had the audacity to say that the gas industry was not paying sufficient for its coal. He maintained that the prices paid for gas coal were more than sufficient, and he believed the coal industry would do better for itself if, instead of wanting to charge higher prices to an industry in which coal was part of its life-blood, it would take a look at its own wasteful and inefficient usage of coal on colliery plant, and see where real economies could be effected there. He had yet to see a really efficient boiler plant at a colliery, and there was very great wastage of coal. Many a colliery was wasting away four or five hundred tons of coal per week, and thereby throwing away four or five hundred times 14s. 6d., which the coalowners said was an uneconomic price for coal for gas-works. The gas industry, from which they demanded more money for coal, had never yet been able to issue bonus shares to the extent of 100 p.ct., as the coal industry had been able to do in the past. There had been times when coal of a similar character was being sold to electricity undertakings for steam generation at 5s. or 6s. per ton less than to gas undertakings. There was no justice in that kind of thing. If there were any differences in the price of coal as between one consuming industry and another, surely the advantage should be with the industry which demanded more. In heavy engineering, for instance, the cost of fuel was under 2 p.ct., and that industry could much more easily afford to pay a higher price than (say) the gas industry, in which the cost of coal was about 45 p.ct. It was foolish of the coal people to tell the gas people to regain the increase from the consumer. These were not days when the gas industry could, even if it wished, put extra charges on the consumer.

Tar and Ammonia.

The industry was faced at present with many other problems of a serious nature. Ammonia was producing nothing. Tar until recently had been very much on the downward grade, though he was glad to note that it had shown a slight increase during the past month; but the creosote position was not good, and had a big bearing on the finances of gas undertakings—finances which kept the undertakings working. "My message to you Juniors," said Mr. Shapley, "is that, though you are undoubtedly enthusiastic, you have got to put yet a little bit extra forward for the industry. You have all got to do a little bit over your job; just like the members of the Council of your Association are putting in more than their own job." [Hear, hear.] All in the gas industry had to make themselves even more efficient in their service to the public, because the public, despite the much advertised and boosted claims of any other fuel, appreciated service and would support those who gave it. The very humblest of employees in the industry must have this fact inculcated into them. Every man in the gas industry must be made a commercial traveller for his industry. The industry needed all the help it could get to-day, and he, as one in charge of a large undertaking, would like to assure all the Juniors that there was nothing that big undertakings could do that was not open to any member of the industry, however humble, to look around and secure any information available on the manufacture or distribution or selling side. They had to get the team spirit working throughout the whole of the employees in the industry, and he was greatly encouraged by the illustration of that spirit as shown at Leeds recently in the spontaneous presentation to himself. Those in charge of gas undertakings, or of particular departments, must see to it that they had the men with them; that the men could have full confidence in the knowledge that in case of need they would get a fair and full hearing. A little personal interest must be taken in them and their particular troubles, and the men in return would respond as the industry needed them to respond.

In the course of a speech to the Seniors in the Eastern Counties the other day, said Mr. Shapley, he had emphasized that it was essential that heads of departments and juniors should be properly paid, to encourage into the industry the proper type of men. Some of the advertisements which had been seen, in the Technical Press, for men to fill positions were of the kind not likely to attract the class of man the industry needed. To the Juniors and to those in charge of the rank and file, he would say, "You who come in direct contact with the workmen, be firm, but be kind. If they know you are kind, they will appreciate you. If you are also fair, they will know they can trust you, and if they trust you they will know that if they have any grievances they will get a fair hearing, and they will work all the better for their undertaking and for the industry. Play the game with the men. The team spirit is what the industry needs." [Applause.]

Mr. W. B. McLusky, asked by the Chairman to say a few words to the meeting, remarked that he had been greatly impressed by the simple and earnest appeal made by Mr. Shapley to the sportsmanship instinct in every man. He thought particularly of the great problem of tact. It was not always that one found energy and tact combined in the same man. The man of quick decision and quick action was liable sometimes to act almost too quickly, and not tactfully. Nevertheless, he (Mr. McLusky) believed it was possible to have the well-trained man of energetic mind who could think fast enough before he started to enable him to do the right thing. They had such a man in Mr. Shapley; and if they could not have more of that type of man in the gas industry, he was afraid the best of their efforts as an industry were liable to be wasted. Mr. McLusky said he particularly liked Mr. Shapley's appeal to the Juniors to look after the interests of their undertaking. If they did that, the undertaking would look after them. Hard work would go far in the welfare of the industry, but there was much to be said for the policy of work hard and then hard play, to refresh the mind and body.

Votes of Thanks.

Mr. J. W. Horwill (Bradford), moving a vote of thanks to Mr. Shapley and Mr. McLusky, said it was a unique occasion for the Association to have at its annual meeting the President of the Institution of Gas Engineers, and also the President of the Manchester District Institution. It was many years since the Presidency of the Institution was in Yorkshire, but they hoped that in the future Yorkshire would be more frequently represented in that high office. Mr. Shapley and Mr. McLusky were widely acknowledged as leaders in the industry, and the Yorkshire Junior Gas Association was proud to have them both among its Hon. Members. Mr. Horwill said he would like to emphasize that the object of the existence of the Junior Associations was solely directed towards fitting their members to give better service. They welcomed the improvement which the Institution had brought about in the Education Scheme, and could assure the Institution that the Juniors would use every endeavour to take advantage of the scheme, so that the parent body would grow and the industry gain by the acquisition of more qualified workers.

Mr. C. H. Chester (Wakefield) seconded the vote.

Mr. Shapley, responding, said he was very pleased Mr. Horwill had proposed the vote of thanks. Mr. Horwill was one of the ablest men in the Yorkshire Junior Gas Association. In fact, they were coming to regard him almost as one of the Seniors, because of the work he had carried out on the commercial side of the industry; particularly his work as a member of the Coke Committee of the West Riding, which had done most important work in placing contracts in that direction. Mr. McLusky and he (Mr. Shapley) were old friends. He wanted to pay a special tribute to the "man" in his friend McLusky. There was a time when they were both applicants for the same position. "Mr. McLusky thought he was going to get it," said Mr. Shapley, "and, of course, I hoped he wasn't. [Laughter.] History has shown that I got the job. He must have been disappointed, but he showed his spirit by walking into the committee room and telling the Committee that they had chosen the best man. A man who can do that, I claim, is a big man." [Loud applause.] It had been through the instrumentality of Mr. McLusky, proceeded Mr. Shapley, that papers had been read by Juniors at the Manchester District Institution meeting. He wished to congratulate the writers of these papers, and he did not think the Senior Institution had lost any lustre because the Juniors were given their "place in the sun." [Applause.]

Mr. McLusky said that the finest tribute he could pay to the President's address that day was the spirit of it, and he hoped that was the spirit which was going to permeate the industry.

Hearty thanks to the Leeds University authorities for their hospitality in finding accommodation for the annual meeting were voiced on behalf of the gathering by Mr. S. T. S. Musgrove (Sheffield).

Mr. H. J. Hodsman, of the Fuel Department of the University, in responding in the unavoidable absence of Prof. J. W. Cobb, said it was always a pleasure for the University to give what little assistance it could to the members of an industry to which the University itself owed a great deal.

The members afterwards had tea together at the Griffin Hotel, Leeds, and a happy smoking concert followed.

A toast to "The Visitors" was proposed by Mr. Packer.

Mr. W. B. McLusky; Mr. Thompson, of Messrs. Arthur Wharton, Ltd.; Mr. W. Town, of Messrs. George Craddock & Co., Ltd.; Mr. H. C. Appleby, President of the Manchester and District Junior Gas Association; and Mr. F. A. C. Pykett, a former Hon. Secretary of the Yorkshire Association, and now of the Midland Junior Gas Association, responded.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Some 96 members of the Association visited the Bradford Road Works of the Manchester Corporation Gas Department on Oct. 12, and were received at the Works Offices by Mr. A. L. Holton (Manager), who formally welcomed his fellow members. Several members of his staff officiated as guides.

The new waterless gasholder, now in course of erection, was inspected, and great interest was displayed in this type, which is 175 ft. in diameter; the walls will be 235 ft. high, and the full height from the ground will be 250 ft. The holder, when fully inflated, will contain 5 million c.ft. of gas.

Tea was served in the General Offices, Mr. F. B. Small, the acting President, presiding.

Mr. W. L. Heald (Preston) moved a vote of thanks to the Manchester Corporation Gas Committee for their kind permission to visit the works and also for their hospitality that afternoon. In the course of his remarks, he said that Mr. Holton's membership with the Association extended over a period of some 25 years.

Mr. C. H. Bamber (Bolton) seconded, and spoke of the educational advantages that were derived from visits to works.

Mr. H. C. Applebee, in supporting, desired to express his own personal thanks for the help given that afternoon by Mr. Holton, and also to Mrs. Holton and lady friends, who had done the catering on behalf of the Gas Committee.

Mr. Holton, in reply, said the Chairman (Ald. T. Cook) and Mr. Shillito regretted their inability to be present. It would be a pleasure, he said, to pass on to his Committee the vote of thanks that had been accorded, and also to his staff, from whom he had very loyal support. They were delighted to know that the members were to elect one of their number as President, which he considered an honour to them and their works.

After tea, the members re-assembled, and Mr. F. B. Small performed the duty of installing the new President, and transferred from himself to Mr. Applebee the President's Badge, which is worn on all official occasions. The annual report was then read by the Hon. Secretary (Mr. J. Alsop). The membership of the Association is now 252.

Election of Officers.

The following officers were duly elected:

Senior Vice-President.—F. B. Small (Liverpool).
Junior Vice-President.—C. H. Bamber, B.Sc. (Bolton).
Hon. Secretary.—J. Alsop (Bolton).
Hon. Treasurer.—I. H. Massey (Oldham).
Hon. Auditor.—I. H. Cadman.
Members of Council.—Messrs. H. B. Knowles (Lancaster), T. H. Williams (Crewe), A. H. Collinge (Preston), T. Caldwell (Widnes), and J. Melling (Oldham).

Election of Two Hon. Members.

Mr. J. Alsop proposed that Mr. Buckley should be made an Hon. Member of the Association in recognition of the very valuable services he had rendered to them from time to time over a long period of years.

Mr. I. H. Massey proposed that Mr. R. H. Garlick should also be made an Hon. Member. He was one of the founders of the Association, and was now retired, and this would enable him still to keep up his connection with the members.

Prizes for Best Papers.

The Council had adjudicated the papers given during the last two sessions, and awarded prizes to:

Mr. J. A. Jackson (Bolton), £2 2s. Donor of prize, Mr. T. Duxbury.

Mr. A. K. Collinge (Preston), £2 2s. Donor of prize, Mr. W. Glover.

PRESIDENTIAL ADDRESS

of H. C. Applebee, A.I.C., F.C.S., of Manchester.

The sales of gas in this country continue to increase, and in the last five years that increase has amounted to nearly 10 p.ct. Those best informed know that the industry is neither fixed, static, nor unalterable. The absence of these signs of death, and the positive evidence of increasing demand and sales, surely give sufficient proof of life. On the other hand, our satisfaction is chastened by certain facts. As already pointed out in Technical Journals, the increase in gas sales was lower last year than in any year since 1921, and the gas used per consumer actually decreased by 1·8 p.ct.

Conditions to-day are such that the most strenuous efforts are necessary in order to maintain our position, and to advance. Competition, much of it legitimate, from many sources affects the sales of our products. Electricity, coke oven bye-products, synthetic ammonia, and low-temperature carbonization all operate in fields in which the gas industry once held sway.

In addition, we have still to meet and counteract a large amount of ill-informed criticism, ignorance, and even ill-will. The general public is not as well informed as it should be, the fault being no doubt, in part, our own, while the Press is far too often used to our disadvantage.

The late Mr. J. G. Newbigging, in an address given at the Institution Meeting in 1911 on "The Scientific Carbonization of Coal," said: "The gas industry has often been charged with conducting its gas manufacture operations, particularly with regard to the distillation of coal, in an unscientific manner, and with having effected no fundamental change in this branch of its methods since the day of Murdoch. It cannot be gainsaid that there is much truth in these assertions." Since those days considerable advances have been made, but I believe that much remains to be done. The industry recognizes these facts, and, in the recognition, there are hopes and confidence for the future.

Among the signs of this recognition, I would mention three only.

(1) The Institution Charter.
(2) The Education Scheme.
(3) The Research Committees of the Institution.

THE PRESIDENT.

H. C. Applebee, A.I.C., F.C.S., of Manchester.

Mr. Applebee was born in London and educated at the Central Foundation School, obtaining a certificate of the Department of Technical Chemistry, in 1905, at the City and Guilds Technical College, Finsbury. In the same year he was appointed Assistant Chemist at the Tar and Products Works of the Gas Light and Coke Company at Beckton, where he served for five years. In 1910, he received the appointment of Works Chemist with Messrs. Major & Co., Ltd., of Hull, where he served for two years, afterwards receiving a similar post with the Clayton Aniline Company, of Manchester, until 1914, when he obtained his present position of Chief Chemist at the Bradford Road Works of the Manchester Gas Department.

The Charter of the Institution.

First then, take the Charter of the Institution of Gas Engineers. It is unfortunate for the individuals concerned, and perhaps for the industry as a whole, that gas supply men and chemists are precluded from corporate membership of the Institution, and many will find little consolation in the promised, and without doubt sincere, welcome as Associates. We are given to understand that the position arises rather from outside the gas industry than from inside, but it is strange that chemists should be excluded; for, while I would not underrate the part which engineering must play, gas manufacture is primarily a chemical process, and the problems of the future largely chemical.

It is strange also that gas supply men, whose problems centre so largely round engineering matters, should also be excluded. But all of us—gas engineers, distribution men, salesmen, and chemists—should welcome the changes brought

about by the Charter, in so far as admission to the Institution, and the Institution as such, are put on a more satisfactory basis. Dr. C. C. Carpenter has said, "the Institution must henceforth be regarded as standing wholly upon a scientific foundation, and not in any sense of the word upon a social one." The junior associations will wish nothing but good to the parent Institution in the new era which has recently opened.

The Education Scheme.

Then as to the Education Scheme. The Education Scheme is, by its very nature, a matter of vital interest to the junior associations, and I believe it to be of vital importance also to the future of the industry. The junior associations—among them our own—may, with justice, be proud of the part which they played in its inception and development, and which they are still playing in the operation of the Scheme. Mr. F. W. Goodenough has said that the Charter of the Institution could not have been obtained but for the existence of the Scheme of Education. Full as that statement is of significance for the future of the Institution itself, the operation of the Education Scheme is of still more importance to the gas industry.

It is almost a truism to say that the future of the industry depends upon a highly trained and competent personnel; and those who pass the various examinations under the Scheme should be adequately equipped to carry into effect, with understanding, the improvements and modifications which the future must bring to the industry. I do not propose to discuss in detail the amended Education Scheme, which has recently been issued. Most of us could, I imagine, find some defects. The total exclusion of organic chemistry, for example, seems unwise; for the study of coal itself and of the process of its destructive distillation surely calls for an adequate knowledge of organic chemistry.

If any apology for dealing with the subject were needed from me, I would plead that, having been a member of your Council from the time when an Education Scheme was first broached, and having had the privilege of teaching experience for some few years, it is not unnatural that I should develop a keen interest in the subject of technical education in general, and education for the gas industry in particular. I approach the subject with a very real appreciation of the difficulties of students, and a not less real sympathy with their efforts.

Value of Ancillary Subjects.

In the first place, then, I would commend the fact that this is an Education Scheme and not merely an Examination Scheme. There is a disposition in some quarters to criticize the insistence on ancillary subjects. The objection to their inclusion in the Education Scheme is, I believe, mistaken. I would go even further, and suggest that many promising students are hampered by an inadequate general education. Those who have had the conduct of classes will have found that some among the students have shown a distressing inability to write even passable English. In support of this statement, I would quote Mr. Madden, who, in 1925, when Chairman of Board of Examiners, at the Conference of the Education Consultative Committee (Board of Examiners and Teachers), said, "I should also like you to convey to the students one matter that we have in our mind, and that is the matter of English. We all feel that English should be taken into account. Some of the drafts are very ragged at times, and it seems to me that students who read some good literature would improve very much in their method of expression."

A good general education is of great advantage—even essential—to the adequate study of any subject, and it is not less important in the study of gas engineering. It is of little use to have ideas, and to be without the facility of clear expression. Ideas of intrinsic value may be obscured and even lost in a cloud of loose words, or by a deficient vocabulary.

Perhaps I may venture to suggest to the really junior "Juniors" that they should not neglect intelligent general reading by which they might acquire a better knowledge of their mother tongue, and a wider vocabulary, while at the same time they might find some acceptable and necessary relief from the strain of their regular studies. It is true that the possession of certain certificates, such as matriculation, General Schools Certificate, &c., procure for the student exemption from examinations in certain of the ancillary subjects under the Scheme, but for the time being there is no insistence on a general educational standard. It would be unwise, and not a little unfair, to introduce this qualification at present, but I think it should be kept in mind.

The aim of any education scheme should be to train the student in habits of thought, rather than to "cram" him for examination purposes. If the Education Scheme produces merely a body of men crammed with all available knowledge, or with the minimum necessary for the passing the several examinations, then it is a failure. As the Education Committee's report for 1928-29 says, "No certificates or diplomas can be of real value as evidence of the fitness of their possessors for appointment or promotion to position in the industry, unless they are based on something more than the capacity of candidates to answer examinations questions."

Prof. Smithells, in an address entitled "Some Notes on the Teaching of Science," given in 1925 to the Conference of the Advisory Committee and Teachers, &c., said that the testing of knowledge by examinations presents many difficulties. Written examinations alone may be very misleading even as to knowledge, and useless as to practical proficiency.

The Education Scheme culminates in examinations, which are from some points of view undesirable. Unfortunately, a practical substitute for examinations in determining proficiency has yet to be found, and so, with all its defects, the examination must remain part of the Scheme. But I would urge that the most valuable part of the Scheme lies in necessary systematic and progressive acquisition of knowledge and in the cultivation of habits of logical thinking and application.

Dr. Little, in his Presidential Address to the Society of Chemical Industry, at the Annual Meeting held in Manchester a few months ago, spoke of knowledge as being divisible into two kinds—static and kinetic. "Static knowledge," he said, "may satisfy the individual; but only as knowledge becomes kinetic can the world's work be done. It becomes kinetic as it remoulds men's minds, or induces thought which leads to action, and it then finds, perhaps, its commonest expression in invention." Kinetic knowledge is needed in the gas industry, as in every other, and we must rely for it in the future largely on those being trained in gas engineering, and no less in all the other branches of the industry, in supply, utilization, and even chemical salesmanship.

Mr. F. W. Goodenough, whose work for the industry in connection with the Education Scheme is known to you all, called attention, at the Annual Conference of the Incorporated Secretaries' Association, to the fundamental importance of salesmanship to commerce and industry, and added later that what industry needs most is not State-help, but self-help. The rule of thumb methods of the past must give place to more scientific methods in every branch of our own industry. And that leads me to my next point.

Research.

The disposition on the part of some within the industry to sneer at what they call "purely academic" research, reveals a mistaken mentality.

Dr. F. B. Jowett (Vice-President of the American Telephone and Telegraphic Company)—quoted by Dr. Little—in a recent paper says that those who pride themselves in being practical are frequently guilty of failing to recognize the immensely practical contributions which science has made to our everyday affairs.

And so my third point is found in the interest now being taken in research work and in the Institution's Research Committees. The mere list of the Committees and a perusal of the Reports furnish evidence of the determination of the industry to face its problems in a scientific manner.

In coal research, the work being carried out on the constitution of coal may appear to some to be unimportant—or to bear no relation to practical gas manufacture. But, fortunately for the industry, many more believe in it. We should not rest satisfied until we are sure that our methods are beyond improvement; and I do not think we shall reach that point until we are in possession of a reasonably exact knowledge of the constitution of our raw material. It may prove even then that our present methods are the best; but we ought not to be satisfied with anything less than the certainty. But however that may prove to be, we have no excuse for any failure to get the best out of existing and available methods.

The reactions taking place during the distillation of the coal, the effect of the various factors in carbonizing conditions, the absolute control of those conditions to produce the best results—all call for close and continuous study.

The steaming of coal, the effect on the ash content in "straight" carbonization and in steaming, and on the residual coke, all call for further study. We all know, for example, that different coals give different results in steaming, and investigation of the reactivity of coke to steam, as well as to carbon-dioxide, is needed—and is indeed being undertaken by one of the Research Committees.

Ammonia Recovery.

While the use of coke rather than coal for domestic and industrial purposes is in itself an important contribution to the abolition of smoke, the reduction, or if possible complete removal, of the sulphur in coke, and its complete removal from gas, are further desiderata. While not forgetting the valuable work that has been done in the latter direction, the problem is not yet completely solved. In the purification of gas the processes of condensation and ammonia recovery still present for solution problems more or less serious. The position of the markets, and the effects of increasing supplies of synthetic ammonia, have brought the question of ammonia recovery into greater prominence than formerly. The necessity for the complete and economic recovery of this product becomes increasingly important.

The semi-direct process for the recovery of ammonia has not commonly been applied in gas-works practice, and the attempts to adapt the process to the peculiar conditions obtaining in

gas-works will be watched with interest by the industry. Further complication arises from the difficulties in the disposal of the effluent liquor from ammonia stills. The treatment of the effluent itself for the removal of phenolic bodies, thiocyanates, &c., is at best a palliative, and it would certainly be more logical, and probably more effective, to direct efforts to the liquor itself, or better still to methods of prevention. Close scientific control and much more experiment will be needed before the problem is solved.

In the purification of coal gas from H_2S much interest has been aroused by the wet processes—removal by sodium carbonate solutions, &c. In many works the removal of H_2S by dry purification is a distinctly casual process. But here again there is need for closer study of the process, so that the best conditions may be discovered, and these conditions maintained in the day-to-day working of the plant.

Gas Manufacture a Chemical Process.

If I have appeared to emphasize chemical matters, it is for two reasons—first, that it is the phase of the industry in which my immediate interests lie; and, secondly, as I have already indicated, that gas manufacture is essentially a chemical process. It must not be considered, however, that the need for scientific study is limited to the chemical side, for I believe it to be equally true of the engineering, supply, salesmanship, and—dare I suggest it?—management.

It is necessary that the gas-works staff shall include men capable of applying and extending the work of the research organization—men who can keep pace with the discoveries which may be made, and turn them to practical advantage. There will always remain those qualities which no education scheme or scientific training alone can confer—those elusive qualities which make up what we call "personality." Common sense has also an important place, but neither charming personality nor common sense as such will replace the scientific training and mind which have been the main theme of this address.

There is a large number of works of such size that it would be an economic impossibility to staff them with the highly trained men I have been visualizing. One is led to revive the suggestion that there should be established a central organization which should make available even for the smallest works the skilled advice and service that it needs. The suggestion has been made many times before—on at least one occasion within my recollection by our ex-President and Hon. Member, Mr. W. Buckley. Has the time come for its fulfilment?

I cannot forbear to add one other point. If the industry needs such men as I have indicated—and I believe it does—it is surely not too much to suggest that they should be adequately remunerated. Unless that is done, the best men will not be drawn into the industry.

Cultural education largely brings its own reward in the pleasure that it gives, in opening wider vistas to the mind, and in the æsthetic satisfaction without which life is apt to be drab and wearisome. Vocational education, on the other hand, is undertaken as a means of livelihood, and, however great may be the satisfaction in the work itself (and I would not underrate it), those who undertake these duties should be assured of reward commensurate with the years of study already spent, and with the many more years which must follow the adoption of the profession.

We of the Junior Associations are very intimately concerned in these matters, for, as our seniors not infrequently remind us, the future fortunes of the industry depend on us. We may hope that an ever increasing recognition of the scientific basis and demands of the gas industry will bring an even greater prosperity in the future than we have known in the past.

Mr. A. L. Holton moved the vote of thanks to Mr. Applebee for his address.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

The Opening Meeting of the Twenty-Sixth Session was held in the Royal Technical College, Glasgow, on Saturday, Oct. 12. Mr. John Murray (Glasgow), the retiring President, was in the Chair, and there was a good attendance of members.

In calling Mr. Ronald D. Keillor to be the new President, the Chairman spoke very highly of the work done by Mr. Keillor, and expressed the hope that he would have a very successful year.

PRESIDENTIAL ADDRESS

Of Ronald D. Keillor, A.M.Inst.GasE., Assistant Engineer and Manager, Greenock.

As you know, most undertakings have a method of summarizing each day's carbonizing results and likewise the quantity of gas sent out from the works. Where the Gas Regulation Act has been adopted, it is now necessary to convert the volume of gas made and gas sent out to therms, and to record the comparative daily and progressive results both volumetrically and thermally. It is, of course, well known that the volumetric output of gas varies with the rise and fall in calorific value, but experience shows that the variation is not in the ratio propounded by the experts who advocate the supply of (say) 550-B.Th.U. gas.

It is commonly believed that the adoption of a comparatively low calorific value gas necessitates an increase in the volumetric output to deliver for use the same number of gross B.Th.U. to the consumer. Our experience with a gas of 410 B.Th.U. gross, and of low inert content, shows that it is an excellent fuel for all town purposes and that there is trouble neither in its economical production nor in its distribution and utilization with existing arrangements. Arising out of our investigations, however, we have found that there is a point in the range of quality of town gas below which one cannot go without first giving serious consideration to the enlargement of mains and services, &c., and we believe that this point is reached with a gas of about 380 to 400 B.Th.U. containing 10 p.ct., or less, of inerts.

In these days it is somewhat difficult to explain the paradox of largely varying quality and composition relating to the production and use of town gas. I have the utmost respect for the Gas Regulation Act and the liberty it gives to all to choose whatever quality they think is best for them to produce, but I cannot help remarking that, in my opinion, the latitude as regards quality is too extreme, and it would have been better for the gas industry and the consumer if, after careful investigation, and with due regard to the efficiency of utilization, a standard quality had been prescribed for the whole of Britain. Had this been done economic gas production methods would have developed at a more rapid rate than is possible under the present Act.

THE PRESIDENT,

R. D. Keillor, of Greenock.

Mr. Keillor was educated at the Greenock Academy and the Royal Technical College, Glasgow. He was apprenticed to engineering with Messrs. J. G. Kincaid & Co., Engineers and Boilermakers, Greenock, where a practical knowledge of the various branches of engineering was acquired. He has been with the Greenock Corporation in the Gas Manufacturing and Distribution Departments since 1921, having held the position of Chief Assistant Engineer and Manager for the past two years. Mr. Keillor, who is an Associate Member of the Institution of Gas Engineers, is Chairman of the British Junior Gas Associations Joint Council this year.

Effect of Steam on Carbonizing Coal in Vertical Retorts.

In considering the question of gas quality in these competitive times, one should have regard only to advanced methods of

production and to their effect on the eventual efficiency and economy of utilization in typical gas appliances. As most of you are aware, the carbonizing policy of the Greenock Gas Undertaking is to steam the charges in the Woodall-Duckham continuous vertical retorts to obtain a town gas of 410 B.Th.U. gross per cubic foot with a minimum of inerts. This policy has been carried out successfully since the adoption of the Gas Regulation Act in 1922, and our long experience in the production, distribution, and utilization of a town gas of this quality is such that we would not now willingly have it higher. This quality is excellent for all town purposes, and no trouble need be looked for in its economical distribution. Gas of this quality has a rapid rate of flame propagation and a high flame temperature, and, for these reasons, it is found to be cleaner, to burn more completely, and therefore to be more efficient.

With regard to the properties of a good 410 B.Th.U. gas, little reliable information appears to be available, on that account, therefore, it occurred to me that the following analyses, being the yearly averages of the daily testings of the gas produced at Greenock, would be of interest:

Year.	Composition, P.Ct. by Volume.								Gross C.V. Calculated.	Gross C.V. (Gas Examiner's Tests).
	CO_2.	O_2.	Ill.	CO.	CH_4.	H_2.	N_2.	Inerts.		
1927–28	5·57	0·28	1·28	23·98	13·89	49·77	5·21	11·07	413	413·6
1928–29	5·42	0·32	1·32	23·56	13·88	49·44	6·07	11·82	411	412·5

It is interesting to note that the make of gas per ton for the year 1927-28 was 20,924 c.ft., or 85·8 therms, and for the year 1928-29, 21,143 c.ft., or 86·7 therms.

On a recent occasion, while a repair to the steam main was being effected, samples of gas were drawn to ascertain the composition and calorific value *minus* the steaming process, with the following results:

Sample.	Composition P.Ct. by Volume.							Total Inerts.	C.V. Gross.
	CO_2.	O_2.	C_nH_m.	CO.	CH_4.	H_2.	N .		
(*a*) Steaming	5·0	0·2	1·0	26·0	13·11	51·21	3·48	8·68	410
(*b*) Without steam . .	2·2	0·2	1·6	15·6	20·9	48·62	10·88	13·28	460

Though sample (*b*) was drawn only four hours after the steam was shut off (the same throughput of coal being maintained), it was thus possible to approximate the utility of the steaming process. A comparison of the combustion properties of the gases (*a*) and (*b*) was worked out to find their respective heating properties, and is tabulated below:

Sample.	Gross C.V.	Net C.V.	Combustion Products from 1 C.Ft. of Gas.				C.V. of Combustion Products.		Theoretical Flame Temperature, ° Fahr.
	B.Th.U. per C.Ft.		CO_2.	H_2O.	N_2.	Total.	Cooled to 500° F.	Cooled to 2500° F.	
(*a*) Steaming	410	367	0·471	0·804	2·658	3·933	78	31·5	3540
(*b*) Without steam . .	460	409	0·435	0·952	3·179	4·566	72	27·1	3520

In this comparative table, the calorific value of the combustion products is obtained by deducting the heat carried off by the combustion products at 500° Fahr. and 2500° Fahr. from the net calorific value of the gas, and, in calculating the flame temperature, allowance is made for heat losses due to dissociation. It is apparent from this comparison that the steaming process (as was to be expected) has the effect of increasing the flame temperature. It also shows that by reducing the quantity and altering the composition of the combustion products, a subtle change takes place in the heating property of the gas.

Combustion of Town Gas.

In order to explain this change in the heating property of the gas, a short reference to combustion is necessary. When town gas is burned in air, heat energy is obtained from the combustible gases. It is well known that the flame observed during such combustion is merely space occupied by the burning—or combining—gases and that the heat available for utilization is contained in the products of combustion.

It is possible to calculate the theoretical flame temperature from the analysis of the gas being considered; but at the same time it should be remembered that the flame temperature does not entirely depend upon the gross calorific value. For example, the flame temperature of blue water gas is higher than any form of coal gas. This is due to the comparative simplicity and the rapidity of the reaction of carbon monoxide and hydrogen with oxygen, and also to the relatively small proportion of nitrogen introduced to the flame. With regard to straight coal gas, however, the more complex reactions of the hydrocarbons slow down the rate of union, and introduce more nitrogen to the flame due to the increased proportion of oxygen necessary for combustion. For those reasons, therefore, the flame temperature of straight coal gas is lower in proportion to the gross calorific value than that of blue water gas, or gas from steamed verticals.

The inert gases (oxygen excepted) always present in town gas have a deleterious effect upon flame temperature and the effective heating value. It is necessary, therefore, when calculating or estimating the combustion products, to make due allowance for the inerts; likewise for the oxygen present, which reduces the amount of air required for combustion.

Combustion with Regard to Effectiveness of Utilization.

The effective heating value of a gas will depend upon (1) the flame temperature and (2) the quantity and composition of the combustion products. Accordingly, when determining the best quality of gas to produce and distribute, the following set of conditions arises:

(*a*) Unless the complete analysis (and flame temperature) of a town's gas is known, it is impossible to determine:

(1) The quantity in cubic feet necessary to perform a therm of effective heating work;

(2) The relative quantity of another gas of known analysis to do the same effective heating work, and

(*b*) A gas undertaking is not in a position to determine the quantity in cubic feet of a gas of known analysis and flame temperature required to take the place of its present load unless it knows:

(1) The temperature of the products of combustion leaving each of the appliances in use on the district, and

(2) the quantity of gas being consumed in each of those appliances.

Owing to the practical difficulties in the way of their accurate determination, conditions (*b*), (1) and (2) may be modified to read as follows:

(1) The average temperature of the products of combustion leaving each type of appliance on the district.

(2) The estimated proportional consumption of the total gas being consumed in each type of appliance.

The extent to which these conditions affect the volumetric output of various qualities of town gas may be determined by assuming that the average temperature of the combustion products from the appliances is (say) 500° Fahr. or 2500° Fahr., and then calculating their respective effective heating properties under such conditions. Appendices A, B, and C are the result of such an investigation, and show how the volume of town gas, doing the same effective heating work as another gas, may vary with the temperature to which the combustion products are cooled.

Compared on a gross heating value basis, it will be observed that the volumetric ratio between the 561·7 calorific value gas and the 408 gas is, as 1 is to 1·38, and if the combustion products are only cooled to 2500° Fahr. then the volumetric ratio to do equal effective heating work is as 1 is to 1·04.

It will be noted that the figures in the appendices are theoretical, and do not allow for the greater heat losses experienced in practice when dealing with the larger quantities of combustion products from the high quality gas burned in ordinary ap-

pliances. In view of this, it should be our aim to find out a little more about the effectiveness in use of the various qualities of gas. I will try to illustrate how the effectiveness of utilization affects the use of typical appliances, such as the gas cooker oven and the incandescent gas burner.

Flues for Cooker Ovens.

There has been considerable controversy recently in the Technical Press with regard to the provision of outside flues for gas cookers to lead the combustion products and steam away from the kitchen. Theoretically, this is advisable, and no great difficulty is presented in providing a flue where new buildings are concerned. To do so, however, in an old building is quite another matter and presents many practical difficulties owing to the limited available cooker positions relative to outside wall space. In face of such difficulties and bearing in mind that the utility and safety of gas cookers operating in the kitchen atmosphere is already well proved, the only apparent methods of preventing the overheating of kitchens are (1) further to increase the oven efficiency; (2) to reduce the quantity of combustion products issuing from the oven while retaining the same oven efficiency; and (3) to improve the natural ventilation of the premises. Pre-heating the gas and air, or both, before combustion by recuperation would improve the efficiency of the oven burner, and a comparison of the quantity of combustion products from gases of known analyses would show to what extent improvement could be effected by reducing the quantity of the combustion products.

Let us assume that the flue temperature is 500° Fahr.; then with an oven burner using gas at different rates to supply 20,000 B.Th.U. of effective heat per hour, the theoretical quantity of heat carried by the combustion products into the atmosphere is as follows:

Type of Gas.	B.Th.U. per Hour.
Reference 1 Appendix "B" (561·7 C.V.)	9198
" 4 " (408 ")	6770
" 5 " (330 ")	5091

Not knowing the precise quantity of secondary air necessary to prevent smothering when different qualities of gas are used, it is difficult to say if the figures in Table 4 show the real extent of the advantage in favour of gases Nos. 4 and 5 over No. 1. It will be seen, however, that the lower quality of gas has the advantage of promoting a cooler kitchen atmosphere, owing to the lesser volume of combustion products, and this advantage should certainly not be lost sight of. This theory applies to all phases of gas usage, including lighting.

Incandescent Gas Lighting.

Owing to the extent of our lighting load, and the fact that it is a very desirable night load, we must guard it jealously. Since the introduction of the Welsbach mantle, which, incidentally, was designed to fit the flame of the original bunsen burner, the only material improvements have been in the inversion of the burner, the addition of the preheating chamber, and the adoption of a smaller mantle. Accessories such as more attractive fittings and reliable distance control methods have helped to popularize gas for lighting, and recently the Horstmann Gear Company gave us an admirable distance control device which should be helpful to all gas salesmen. Notwithstanding these developments, there is room for much improvement in burner design, and it appears to me that altering the shape of the flame and the mantle in such a way that a minimum of heat is lost is a feasible proposition and an argument in favour of further research. For example, it is reported that we obtain approximately 60 candle-power from 550 B.Th.U. (gross) gas burning at 2½ c.ft. per hour in an incandescent burner, which may be expressed as 22·9 B.Th.U. per candle. By way of comparison, an electric fitment gives an efficiency of 1 watt per candle or 3·4 B.Th.U. per candle. This difference is mainly due to the heat carried in the comparatively large volume of combustion products leaving the mantle. It is known that the mantle temperature of a low-pressure incandescent burner is maintained at upwards of 2000° Fahr., but, as I am not aware that any real attempt has been made to determine the candle-power of incandescent mantle burners with gases of varying calorific value and composition, I would suggest research in this direction.

Since the flame temperature of a good 408 B.Th.U. gas is higher than that of the 561·7 gas referred to, it is reasonable to suggest that the lighting efficiency in an incandescent burner is also higher. Indeed, one has only to observe the high intrinsic brilliancy in a medium size incandescent mantle supplied with 410 B.Th.U. gas, compared with (say) 550 B.Th.U. gas, to realize the difference in favour of the lower quality.

If gas lighting efficiencies are not improved, then the attractive scale of charges for electricity may eventually necessitate the granting of special rates for gas lighting. Competition has become so fierce in this sphere that any improvement in efficiency that may be obtained will have the effect of throwing the balance of cost even more in our favour.

Commercial Balance of Gas Making Processes.

It will be appreciated that the foregoing notes comparing the utility of various qualities of town gas have a bearing on the eventual cost to the consumer. In this connection, it is also of importance to study the policy of other gas undertakings, with a view to adopting other methods if it be found advantageous to do so.

Those of us who have access to the complete data regarding the undertaking we serve endeavour to find out from such data if it is possible to cheapen the cost of production and the ultimate cost to the consumer. If our own results cannot be improved, good and well, but it is always advantageous to compare results with those of other undertakings. In this way many interesting things are revealed, and we benefit by the study of other people's methods. The "Gas World" Analyses of Municipal Gas Accounts and Gas Companies' Accounts are invaluable for comparisons of this nature. Many engineers, however, appear to be too modest to have the fruits of their labours set out alongside those of their confrères. Let us hope that, in future, all gas undertakings will send along their accounts for analysis. In doing so, they benefit not only themselves but the gas industry generally. In my opinion, it would be a great advantage to have the certified average analysis of the gas supplied included in the analyses of accounts.

One of the best methods of arriving at the comparative cost of the gas-making process is to select a list of undertakings from the published Analyses of Accounts and to calculate the monetary value of the gas, coke, tar, and ammonia produced from each ton of coal carbonized. By dividing the gross receipts from each of those items by the total quantity made, the average price for the year is obtained; this, when multiplied by the average make per ton of each item respectively, gives the necessary figures. Appendix D was prepared on the lines indicated, and the undertakings dealt with were selected from the 1927-28 Analyses of Accounts. For the purpose of obtaining the actual cost of the gas-making process on a comparative basis, a standard price for gas is taken, and in Appendix D Greenock's average price of 7·55d. per therm was adopted. Here it should be noted that, unlike some of the undertakings in the table, there is included in Greenock's price a sum for the provision of free meters, free cooking appliances, and a free maintenance system.

The comparative commercial balance of each process is obtained by deducting the cost of the coal from the value of the gas and residuals. The figures in Appendix D are arresting and go to show that there is much to be said in favour of high makes of gas per ton of coal and lower calorific value declarations. Further, if the effective heating efficiency value of the gas distributed in those towns was brought into account, the result would be even more in favour of lower calorific values than shown.

The Annual Load Factor.

The electrical profession has always been alive to the bearing the annual load factor has on the eventual cost of electrical energy to the public, and their analyses of accounts show the average annual load factor very prominently. This factor is just as important to the gas profession as it is to the electrical profession, and, when considered, helps materially in showing the real progress being made and also the extent to which individual undertakings employ available plant. It is difficult to find a satisfactory way of arriving at the annual load factor of a gas undertaking, but I suggest the following method would be useful:

When S = total therms sold per annum,
and M = total therms the available plant is capable of producing at the declared calorific value per annum,
then the annual load factor could be expressed as a percentage thus;

$$\frac{S}{M} \times 100.$$

"Surplus" Gas from the Coke Oven Industry.

The lay mind is puzzled by the repeated newspaper accounts of coke oven gas being offered at prices which appear to be below the cost of production prevailing in the gas industry. Undoubtedly, an exceptional economic situation has arisen, and offers have been accepted and refused in various parts of the country for such gas. Modern coking plants are very similar to modern gas making plants; in fact, they differ more in name than in principle. The coke oven industry has practically always been able to operate to its utmost producing capacity in summer and winter, while, presumably, their total production of coke has been sold at an economic price, even when consuming all the surplus gas themselves. In finding a market for their surplus gas, they are able to settle down for long periods at maximum overall producing capacity, and, to put it bluntly; they improve their position at the expense of our load factor. Again, since coke oven plants are usually erected at the pit head, they have added economic advantages.

Meanwhile a gas undertaking plods along operating at about one half of its annual producing capacity because of the differ-

ence in seasonal requirements. I do not look with favour upon the erection of large new competitive plants for the production of gas and solid smokeless fuel, &c. The cheapest and best all-round smokeless fuel is gas from the high-temperature carbonization process, and, in my opinion, this is the best process for our country.

CONTROL OF GAS-WORKS PRODUCE SALES.

A remedy for the slump in sulphate of ammonia prices was found in the formation of the British Sulphate of Ammonia Federation, and now Greenock has joined with other Scottish undertakings and tar distilling companies in the formation of a Co-operative Tar Pool, which was formed with a view to improving the price of tar and tar products. Logically, the next step will be a British Coke Sales Association owing to the extension of the coking industry, and to the fact that town gas is gradually taking the place of coke in many industries.

The "B.C.G.A." looks after gas interests with regard to publicity and propaganda in no uncertain manner. It is, however, within the bounds of possibility that gas prices may have to be levelled down, allowance being made for geographical position, if competition from the subsidized electrical grid is to be combated. The future progress of gas as a fuel seems to depend upon a unified policy with regard to the linking up of undertakings with larger producing units, and the attainment of a higher efficiency of utilization.

THE EDUCATION SCHEME.

The Education Scheme of the Institution of Gas Engineers has emerged from its preliminary trials, and, thanks to the minor alterations in the Scheme, its benefits have now been made accessible to students in outlying districts. It is hoped that those now taking up the gas profession as a career will take full advantage of the Scheme. It must be understood that the new body of examiners insist upon meticulous work, and that a thorough practical knowledge must be evidenced in answers to questions and in sketches or drawings submitted. Should any of the members of this Association have difficulty in respect to their course of study, advice will be forthcoming if they communicate with our Secretary.

CONCLUSION.

If one half of the time spent on the development of gas-works processes was devoted to the thorough cleaning up of supply areas and the substitution of modern for the age-old domestic appliances in use, increased goodwill and profit would result. Economies passed on to the public through the use of the best equipment available would promote more business than thousands of pounds spent on advertising. There is no hesitation to scrap inefficient gas-making plant; so why should we shut our eyes to the necessity for similar action in the case of old domestic gas appliances? Old appliances should be scrapped or modernized. In our case, modernizing has been tackled with resolution, in order to combat the open competition and economy of the up-to-date fittings which younger industries have to offer. In the case of undertakings who sell appliances outright or let out on the hire principle, no steps have been taken to pass on to the public the benefit of such economies as arise through the use of modern appliances in tune with the prescribed quality of gas. Neglect of this kind is widespread, and if there is not a change of policy Nemesis will overtake the industry or, at least, greatly retard its rate of progress.

Appendix A.—The analyses of four town gases—also theoretical water gas.

Appendix B.—The heating properties and other data relating to the gases in Appendix A.

Appendix C.—The equivalent quantities of the gases in Appendix A, calculated on the basis of (1) gross heating value, (2) net heating value, (3) net effective heating value when combustion products only cooled to 500° Fahr., and (4) net effective heating value when combustion products only cooled to 2500° Fahr.

Appendix D.—A comparison of the "Commercial Balance" of the gas-making processes in several company and municipal undertakings.

APPENDIX A.

Processes of Manufacture.	Gross C.V. of Gas, B.Th.U.	Analysis of Gas per C.Ft.								Sp.Gr. Air=1.	Air for Correct Combustion of 1 C.Ft. of Gas.	Flame Temperature, °Fahr. *	Combustion Products from 1 C.Ft. of Gas.			
		CO_2.	O_2.	CnHm	CO.	CH_4.	H_2.	N_2.	CO, O_2, N_2.				CO_2.	H_2O.	N_2.	Total.
		C.Ft.	C.Ft.	C.Ft.	C.Ft.	C.Ft.	C.Ft.	C.Ft	C.Ft.		C.Ft.		C.Ft.	C.Ft.	C.Ft.	C.Ft.
(1) Horizontal retorts	561·7	0·015	0·002	0·030	0·070	0·297	0·524	0·062	0·079	0·399	4·9	3540	0·472	1·208	3·946	5·626
(2) Horizontals, verticals, coke ovens, and water gas	487	0·040	0·009	0·025	0·134	0·227	0·450	0·115	0·164	0·506	4·067	3560	0·476	0·979	3·332	4·787
(3) Steamed vertical retorts	412	0·042	0·004	0·013	0·239	0·140	0·499	0·062	0·108	0·492	3·36	3522	0·460	0·819	2·722	4·001
(4) Steamed vertical retorts	408	0·038	0·003	0·012	0·274	0·126	0·497	0·051	0·079	0·498	3·29	3558	0·474	0·783	2·654	3·911
(5) Theoretical water gas	330	..	..	..	0·500	0·500	..	..	..	0·520	2·39	3630	0·500	0·500	1·890	2·890

* Allowing for heat lost due to dissociation.

APPENDIX B.

Final Temperature of Combustion Products.	Gross C.V. of Gas.	Net C.V. of Gas.	Combustion Products of One C.Ft.	Net C.V. of Combustion Products.	Combustion Products Necessary to Give One Therm.	Gas Required to Supply Necessary Combustion Products.		P.Ct. Gross C.V. not Effectively Utilized.
°Fahr.	B.Th.U./C.Ft.	B.Th.U./C.Ft.		B.Th.U./C.Ft.	C.Ft.	C.Ft.	Therms at Gross C.V.	
(1) 60	561·7	497·4	5·626	88·4	1131	201	1·129	11·5
(1) 500	561·7	384	5·626	68·3	1464	260	1·460	31·5
(1) 2500	561·7	130·4	5·626	23·2	4310	766	4·303	76·6
(2) 60	487	435	4·787	90·9	1110	230	1·120	10·7
(2) 500	487	351	4·787	74·6	1340	280	1·364	26·7
(2) 2500	487	135	4·787	28·2	3546	741	3·609	72·3
(3) 60	412	368	4·001	92·0	1087	272	1·120	10·7
(3) 500	412	304	4·001	76·0	1316	329	1·355	26·2
(3) 2500	412	121	4·001	30·2	3311	828	3·411	70·7
(4) 60	408	366	3·911	93·6	1068	273	1·114	10·2
(4) 500	408	305	3·911	78·0	1282	328	1·339	25·3
(4) 2500	408	126	3·911	32·2	3106	794	3·240	69·1
(5) 60	330	300	2·89	104·0	961	333	1·099	9·0
(5) 500	330	264	2·89	91·0	1099	380	1·254	20·3
(5) 2500	330	129	2·89	44·6	2242	776	2·561	61·0

APPENDIX C.

Basis of Ratio.	Quantity of Gas in C.Ft. to Supply the same Effective Heat Value as 1 C.Ft. of the Various Town Gases in End Column.					Various Town Gases.
	561·7 C.V. Gross.	487 C.V. Gross.	412 C.V. Gross.	408 C.V. Gross.	330 C.V. Gross.*	
Gross C.V.	1·00	1·15	1·37	1·38	1·70	561·7
	0·86	1·00	1·19	1·195	1·48	487
	0·73	0·85	1·00	1·01	1·25	412
	0·72	0·84	0·99	1·00	1·24	408
	0·58	0·68	0·80	0·81	1·00	330*
Net C.V.—Combustion products cooled to 60° Fahr.	1·00	1·14	1·35	1·36	1·66	561·7
	0·87	1·00	1·18	1·19	1·45	487
	0·70	0·88	1·00	1·004	1·22	412
	0·74	0·84	0·996	1·00	1·22	408
	0·60	0·70	0·817	0·82	1·00	330*
Net C.V.—Combustion products cooled to 500° Fahr.	1·00	1·08	1·26	1·26	1·46	561·7
	0·93	1·00	1·17	1·17	1·36	487
	0·79	0·895	1·00	0·997	1·16	412
	0·79	0·854	1·003	1·00	1·19	408
	0·68	0·74	0·87	0·86	1·00	330*
Net C.V.—Combustion products cooled to 2500° Fahr.	1·00	0·97	1·08	1·04	1·19	561·7
	1·034	1·00	1·12	1·07	1·05	487
	0·925	0·844	1·00	0·959	0·94	412
	0·965	0·933	1·043	1·00	0·98	408
	0·987	0·955	1·067	1·023	1·00	330*

* Theoretical water gas.

APPENDIX D.—*Comparison of the Commercial Balance of Gas Making Processes.*

["Gas World" Analyses of Accounts.]

Undertaking (Co. or Mun.).	Declared Calorific Value. Gross C.V. B.Th.U./C.Ft.	P.Ct. B.W.G. or C.W.G.	Value of Products per Ton of Coal Carbonized.									Total Value of Gas and Residuals, Assuming Price of Gas 7·55d. per Therm.	Cost of Coal per Ton.	Value of Gas and Residuals, *Less* Cost of Coal.
			Gas.		Coke.		Tar.		Ammonia.		Total.			
			Make. C.Ft.	Value.	Make. Cwt.	Value.	Make. Galls.	Value.	Make. Lbs. or Galls.	Value.				
				s. d.		s. d.		s. d.		s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.
South Metropolitan Gas Company	560	*nil*	12,701	53 10	11·2	10 10	10·1	4 8	33·2 lbs.	1 0	3 5 8	3 1 3	27 10	1 13 5
Newcastle (Co.)	500	2·87	12,010	38 8	10·4	12 3	9·3	4 11	19·9 lbs.	0 5	2 16 3	2 15 4	17 3	1 18 1
Bath (Co.)	480	25·80	15,371	39 2	9·7	12 4	7·6	4 6	25 galls.	0 7	2 16 7	3 4 3	27 5	1 16 10
Coatbridge (Co.)	475	*nil*	13,440	50 2	8·6	15 2	17·6	7 11	37·8 lbs.	1 8	3 14 11	3 3 4	31 9	1 11 7
Hamilton (Mun.)	440	*nil*	13,961	41 5	7·1	8 1	15·7	8 7	34·7 lbs.	1 7	2 19 8	2 16 2	15 10	2 0 4
Falkirk (Mun.)	430	*nil*	17,065	61 2	5·0	5 3	18·7	6 4	28·4 lbs.	1 1	3 13 10	2 18 10	16 11	2 1 11
Macclesfield (Mun.)	420	4·80	21,434	60 10	6·5	4 9	18·1	6 2	Loss of	1 1	3 9 10	3 6 6	22 1	2 4 5
Greenock (Mun.)	410	*nil*	19,958	51 5	7·4	5 3	21·1	7 0	28·9 lbs.	1 5	3 5 1	3 5 1	19 7	2 5 6

500 Edinburgh—£1 15s. 11d. 470 Glasgow—£1 12s. 3d. 430 Dunfermline—£2 2s. 5d.

Discussion.

Mr. MURRAY, in opening the discussion, said that he favoured the idea of week-day Junior meetings, and trusted that the suggestion might bear fruit. He was particularly impressed with the concluding part of the address. What interested the consumer was not really the method of production, but the service given and the size of their accounts. He was very pleased to see that the idea of scrapping obsolete appliances was advocated in the paper.

Mr. D. MELVIN (Uddingston) expressed his interest in Appendix D, and asked for further information regarding the Coatbridge and Greenock figures.

Mr. B. FIFE (Kilmarnock) took exception to Mr. Keillor's statement regarding a standard quality of gas. The quality must depend on three things—(1) the type of coal available; (2) the size of the town; and (3) the market for bye-products. Times had changed since 1918, when gas was secondary to the bye-products. He agreed with Mr. Keillor's statement as to the excellent properties of a 410 B.Th.U. gas with low inerts.

Mr. S. MCGOWAN (Glasgow) said there were some points which were not at all clear to him; the figures did not seem convincing. He considered flame temperature of secondary importance in a cooker oven, for example. The question of value must be carefully considered from both the production and the distribution points of view.

Mr. A. H. SLADE (Glasgow) suggested that the purpose of makers seemed to be to sell the appliance with regard to efficiency and satisfaction from the consumer's point of view. But the public, as a rule, had no real interest in anything but the size of gas bills. He asked Mr. Keillor how the modernizing was effected in Greenock, and how this cost was met.

Mr. T. FRAZER (Dalmarnock) said that in his opinion a very low-grade gas might cause trouble on the district. He asked Mr. Keillor why a 410 B.Th.U. and not a 400 B.Th.U. gas was supplied.

Mr. DAVID FULTON (Helensburgh) expressed his pleasure at once again being with the Juniors, and he wished the Association every success. The address, he said, seemed a little obscure, and he felt that the question of a calorific value should be approached from a very wide angle. The mass of figures submitted required careful examination. He spoke of week-day meetings for Juniors; and remarked that, though he felt sure the Seniors would co-operate, the Juniors must guard against the "easy way." Things worth having were not easily won. Referring again to thermal values, he said they must remember that, though volume varied with calorific value, in his opinion the thermal output remained constant. A standard gas would be too binding, and would hamper research. Referring to an association for the sale of coke, he felt that the tendency was for too many associations, with a corresponding loss of individuality. He then spoke of the Education Scheme. There was, he suggested, a tendency for chemists to concentrate on their own side, and the result was that engineering questions and drawings were not too well done.

Mr. J. BELL (Dumbarton) said that low-grade gas appealed to him, and from experience he found that low-grade gas, with a minimum of inerts, could give a very high efficiency. In Dumbarton, a change had been made from 475 to 425 B.Th.U., and he found an improvement in efficiency of utilization.

Mr. A. L. MCFARLANE (Glasgow) remarked that low-temperature solid smokeless fuel, which was at present in an experimental stage, had proved successful in housing schemes. Undoubtedly a point which was overlooked when considering coke oven gas was that the gas-works had to maintain the same plant summer and winter, whereas the coke oven plant could work continuously.

Mr. KEILLOR, replying to the discussion, stated that it was not the purpose of his address to point to 400 C.V. gas as the most suitable for general distribution, but rather to introduce some advantages in favour of 400 gas, which should be more generally realized. For example, a standard between 400 to 450 might be adopted by this country with advantage from the national point of view so long as the inert content of the gas was limited. The effect of discriminately steaming vertical retorts was to reduce the inert content and to enhance the effectiveness of the resultant gas. The method of drawing up Appendix D had been criticized, but it was representative, and had been constructed exactly as described, in order to compare the respective commercial efficiency of the gas-making processes in various works with that at Greenock. One advantage of a standard quality would be that appliance makers could rate appliances after the style adopted by the electrical industry. The modernizing of appliances was carried out in Greenock by substituting standard cooker hotplates and range-plates of modern design; the cost being met out of revenue as it was incurred. This policy had not affected the price of gas materially. With regard to low-temperature carbonization and the production of solid smokeless fuel, Mr. Keillor said that unfortunately producers of gas were inclined to forget that distribution men had enough competition to face already, and they should realize that the smokeless fuel which their industry must concentrate on selling was gas of a reasonable quality and as cheap as possible.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Dehydration of Gas.

Sir,—I was very interested to read the paper given by Mr. Charles Cooper, M.Sc., of Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, before the Annual Convention of the American Gas Association, in last week's issue of the "Journal," and particularly in respect of the paragraph on "CO corrosion of mains" by partially dried gas, wherein my experience of 1927 was referred to in the footnote. It is gratifying to learn of Mr. Cooper's experiments, and confirmation of the results of my investigation at Cardiff at that time.

Undoubtedly, this topic will be of deep interest to all distribution engineers when faced with the problem of "low space velocity" as can conceivably present itself where a small supply of partially dry gas (intentional or accidental) is taken from (say) a length of otherwise untapped main which has been "capped" in close proximity to this service.

First impressions are supposed to last longest, and a good light and perfectly working appliances mean a happy, and in all probability a permanent, consumer of gas for all purposes. Notwithstanding, it is apparent that modern thoughts and practice are turned towards, rather than against, the storage and distribution of dehydrated town gas.

T. V. Blake.

224, Bradford Road,
Manchester,
Oct. 21, 1929.

British Tar for British Roads.

Sir,—My recent appeal to county councils and other public bodies to use British tar in the making and maintenance of our roads has provoked considerable controversy. The advocates of foreign bitumen, which is the alternative to tar, are very active in defence of their product.

It is stated, on behalf of bitumen importers, for example, that "the bitumen industry means employment, whereas tar is a bye-product of the gas and coke industries, and its use does not involve the direct employment of any more labour."

I would now ask those who take the same view, how many British workmen are actually employed at the four bitumen refineries in this country. I suspect that they number at most a few thousand, but it will be interesting to have the figure for comparison with the 100,000 workers in the gas industry and the large number employed in the coke industry.

As for the second point, that a bye-product does not in itself provide employment, I can only say that if, owing to the use of foreign bitumen on our roads, the market for British tar is lost, it will be a very serious matter for the gas, coke, and steel industries, and also for the miners of this country, who find in the tar producers the biggest commercial consumers of coal.

If the price of tar be taken as 5d. a gallon, the gas companies alone receive £4,000,000 a year from this source. The loss of any considerable part of this vast sum would upset the whole industry, raise the price of gas, reduce its consumption, cut down the demand for coal, and lead to very serious unemployment. The same holds true if the coke industry loses its tar market because of the use of bitumen on our roads.

Let there be no doubt about the point that the use of British tar on British roads is vital to some of our biggest home industries—gas, coke, steel, and coal. It seems folly, therefore, to add to their present troubles by going out of our way to use foreign bitumen as a substitute.

W. Thorne,
General Secretary.

National Union of General and Municipal Workers,
28, Tavistock Square, London, W.C. 1,
Oct. 19, 1929.

Repairing Gasholder Tanks in Action.

Sir,—In reply to "Inquirer" in your issue for Oct. 16, the holder tank can be repaired by welding new plates over the defective portions. These repairs can be executed without disturbing the use of the tank or holder.

Archie E. Plumstead.

A. E. Plumstead & Co., Ltd.,
120, King Street,
Norwich,
Oct. 19, 1929.

REGISTER OF PATENTS.

Sealing of Gasholders.—No. 303,471.

Maschinenfabrik Augsburg-Nurnberg A.G., of Nürnberg.

No. 16,714; June 8, 1928. Convention date (Germany), Jan. 4, 1928.

The patentees claim a seal for gasholders of the moving disc type consisting of sealing bodies which form a ring of iron or other metal, or of sealing bodies made of felt or the like arranged on a sheet metal ring secured to the edge of the disc, characterized by a closed ring of uniform strength throughout, the resiliency of the seal with respect to the inaccuracies of the wall of the holder and the like being effected by the ring being made of such thickness that its elastic expansion under the action of the forces acting thereon from the inside gives the required resiliency. Thus the ring may be made of a material having an especially low modulus of elasticity—for instance, copper or aluminium.

Clockwork Gas Controllers.—No. 317,944.

The Horstmann Gear Company, Ltd., and Horstmann, A., both of Bath.

No. 17,533; June 18, 1928.

This invention relates to gas controllers in which a dial is made to rotate once in 24 hours, time being indicated by an exterior index. The dial carries levers or tappets adjustable thereto. It further relates to the attachment of the dial to a sleeve projection or boss of the barrel or housing of a going barrel.

The object of the invention is to provide another method whereby the dial plate may be attached to the going barrel and may be rendered adjustable thereto. The front portion of the barrel boss is split beyond the bearing, which renders this portion flexible, and the dial plate is provided with a plain unsplit hollow sleeve to fit thereon. The split portion of the barrel boss is flexible, and renders the plain unsplit bush of the dial adjustable thereto.

One or more slits may be cut longitudinally or helically in the frontward portion of the barrel boss. The latter may also be recessed at the frontward portion to allow the key to be attached to the winding arbor, when the latter may be left flush with the front thereof. This split hollow barrel boss may also be used on the extended barrel, in which case the barrel boss does not form a bearing pivot in the front plate and a hollow bearing for the barrel arbor, but only a hollow bearing for the barrel arbor. Advantages of this method are:

The dial bush, having no split portion at the back, is rendered much shorter, and therefore allows of less depth to the instrument,

The dial plate can be attached to its bush at or near the back thereof, and can therefore be mounted much nearer to the front plate or extended barrel.

The split portion of the barrel boss can extend throughout the whole length of the dial bush, thus effecting a good grip on a short sleeve.

Automatic Cut-Out for Gas Installations. No. 318,473.

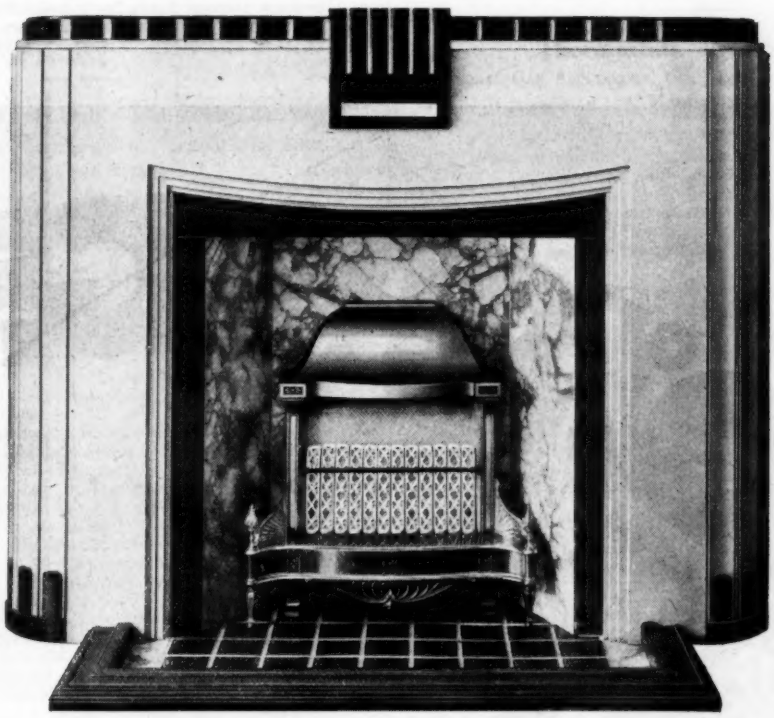
Mendel, S., of Chorlton-on-Medlock, Manchester.

No. 15,073; May 23, 1928. No. 22,388; Aug. 2, 1928. No. 23,808; Aug. 18, 1928.

A particular use of this invention is in the automatic control of gas passing from a coin-controlled meter to gas-lighting and gas-heating appliances.

The apparatus comprises a chamber in the line of the gas supply having inlet and outlet ports; a valve normally held open by a balance weight, for controlling the outlet port means on the inlet side of the valve to close the valve automatically when the gas supply fails and to hold it closed until the gas supply is renewed, said means being moved clear of the valve (on the renewal of the gas supply) and the valve being then held to its seating by the pressure of the gas on its top face; and means for producing on the outlet side of the valve (after the renewal of the gas supply and after closing the final outlet or outlets) a pressure equal to that on the inlet side, so as to allow the valve to re-open under the influence of its balance weight. The apparatus also preferably comprises means for locking the valve against accidental disturbance in both the open and closed positions, or in the closed position only.

The patentee points out that in known automatic gas-controlling apparatus, in which the valve is re-opened automatically by allowing a portion of the renewed gas supply to pass to the outlet side of the valve and by closing all the outlets, the controlling apparatus is on the outlet side of the valve, and the keeping of the valve open while the supply of gas is normal depends upon the pressure of the gas



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below the valve, the valve tending normally to close. In the present invention, the valve tends normally to open, being unaffected by the gas and remaining open while the normal gas supply is maintained. Further, in the present invention, when the locking devices are used, the valve, after closing, is not free to open automatically until released by hand, thereby affording a safeguard against accidental re-opening. Moreover, the valve cannot close until released by parts normally acted upon by the gas supply.

Tar Fog Separation.—No. 319,382.

The Manchester Oxide Company, Ltd., and Clayton, R. H., both of Miles Platting.

No. 15,069; May 23, 1928.

Removal of tar fog from coal gas can be effected in a very cheap and simple manner which obviates the necessity of using expensive washing plant or other apparatus. If the hot gas taken from between the hydraulic main and the condensers is passed up a tower maintained at a temperature above the dew-point of the gas for water, and packed with a suitable loose packing material—Raschig rings—the whole or the greater part of the tar fog can be eliminated, and the recovered tar which collects at the bottom may be run off.

A plain vertical cylindrical tower can be used having a false bottom, a gas inlet at the bottom, a gas outlet at the top and a sump for collection and removal of any deposited tar; and this tower may be filled haphazard with the loose packing material. No further internal partitions are necessary, and there are no moving parts having bearings required to be sealed against escape of gas.

The removal of the tar fog in this manner considerably assists the subsequent purification of the gas and also prevents the polyhydric phenols or "higher tar acids" from passing into the condensers and dissolving in the alkaline liquor, thereby reducing the oxygen absorbing capacity of the ammonia still effluent liquor.

If dephenolated tar is fed down the tower against the upward stream of hot gas, a considerable portion of the other oxidizable bodies may also be removed from the gas, with a further reduction in the contamination of the ammonia still effluent liquor. When dephenolated tar or tar oil is employed for washing the crude gas, the lighter phenols (especially monohydric phenol) which are in the vaporized form are removed from the gas. The tar after use may be dephenolated again, and re-used if desired. The recovered phenols may have a commercial value.

The process may with advantage be carried out in two towers both maintained at a temperature above the dew-point of the gas for water and packed with Raschig rings. Down the second tower dephenolated tar may be passed in countercurrent to the gas, to remove the vaporized phenol escaping removal with the tar fog in the first tower. Hydraulic main tar which has been dephenolated may be used. Instead of continuously withdrawing the tar from the tar well or other point on the plant, a relatively small quantity may be dephenolated, and again after use, either by distillation or washing with alkaline liquids, or by a combination of these methods. As there is no necessity to cool the tar below the dew-point of the gas, a considerable economy in heat is effected.

The crude gas is passed up the tower maintained at a temperature of 80° to 100° C., and is then passed up the other tower also maintained at a temperature of 80° to 100° C., and down which the dephenolated tar flows. The ammonia in the gas after passing through the tower may be recovered by the direct process.

The following is one of a series of experiments carried out with crude coal gas made in a modern vertical retort setting under normal works conditions.

The crude gas was passed up the tower, down which some dephenolated hydraulic main tar was allowed to flow at the rate of 350 c.c. per hour (*i.e.*, approximately in the same proportion as the yield of hydraulic main tar and gas from the coal). The gas was then passed into the condenser. The average condenser liquor obtained when the crude gas was not passed through the tower, after desulphiding contained oxygen-absorbing constituents other than thiocyanates and thiosulphates that required 801 parts of oxygen per 100,000 parts of liquor. The condensed liquor obtained in the experimental apparatus, after passing the gas up the tower, when desulphided contained oxygen-absorbing constituents other than thiocyanates and thiosulphates that required 452 parts of oxygen per 100,000 parts of liquor. In this experiment the condensed liquor from the gas passing through the tower was free from higher tar acids, though these bodies were present in the liquor condensed when the gas did not pass through the tower. The organic oxidizable bodies other than thiocyanates or thiosulphates were reduced by 43·6 p.ct.

Meters.—No. 319,522.

Glover, Thos., & Co., Ltd., and Hoyle, D. G., both of Edmonton.

No. 30,491; Oct. 22, 1928.

This invention relates to dry gas meters in which the flag wires or rods are positioned in opposite corners at one end of the case, whereby a larger movement of the bellows is possible than when positioned on each side of the centre line (so that a larger capacity meter is possible for the same size case), and also in which the slide valves are positioned radially to the cranked or tangent spindle at an angle of 90° to each other. It has been found in practice that great difficulty is experienced in constructing a meter of this class whereby the timing or movement of the valves in relation to each other is correct; and the object of this invention is to overcome the difficulty by constructing the mechanism whereby the timing or movement of the valves in relation to each other is correctly performed in a simple manner.

The main claim is: In gas meters, forming the tangent spindle with two cranks positioned on opposite sides of the spindle and in alignment, connecting each crank with a valve, and positioning each flag wire in a corner of the meter in alignment with a valve and the tangent spindle, substantially as described and as shown on the [annexed] drawings.

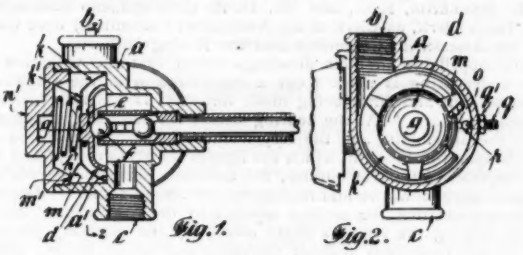
Thermostats.—No. 319,512.

General Gas Appliances, Ltd., and Coleman, F. S., both of Manchester.

No. 29,423; Oct. 12, 1928.

This invention relates to thermostatically controlled valves of the kind comprising a casing and disc-like valve therein operated by a thermostatic element through adjustable regulating mechanism. The objects of the invention are to render the action of the valve less liable to interference by dirt or deposits which may enter the valve chamber and to improve the visibility and construction of the means for operating the valve.

Fig. 1 is a rear sectional elevation; and fig. 2 is a part-sectional and elevation on the line 2—2, fig. 1.



A "General" Thermostat.

As illustrated, *a* is the valve chamber having inlet *b* and outlet *c*. The valve *d*, which is saucer-shaped, is located by a central recess *e* engaging the outer ball *f* of the mechanism. On the back of the valve is a boss *g* over which the small end of a spring *h* is fitted. The valve *d* co-acts with the flat annular face a^1 of the valve chamber; and against such face and surrounding the valve is a dome-shaped dust shield *k*, with central opening k^1, from the edge of which extend three tongues *m*.

The valve chamber is closed by a screwed cover *n* which forms an abutment for the spring *h* and also has an annular flange n^1 adapted to engage the tongues *m* whereby the dust cover may be secured in its position against the face a^1. As seen in fig. 2, the gas on entering at *b* meets the domed surface of the dust cover tangentially. Any impurities therein strike against the baffle and fall to the bottom of the chamber, remaining on the outside of the dust cover. The gas passes through the central opening k^1 to the valve. The by-pass comprises a screw hole *o* immediately behind the face a^1 and a hole *p* in the face a^1 leading into the hole *o*. A grub screw *q* with lock nut q^1 is provided in the hole *o*, the inner end of the screw being pointed to act as a valve.

Detection of Leaks in Mains.—No. 319,561.

Skidmore-Westwood, W. W., of Stourbridge.

No. 1365; Jan. 15, 1929.

This invention is concerned with the known method and means for detecting leaks which comprises the location above or adjacent to the main of vertically disposed shafts.

The method now proposed is characterized by the provision of inspection shafts which are formed as tubular members adapted to be sunk in the soil within which the mains are embedded so that the lower ends of the tubular members are disposed above or adjacent to the main. The lower portions of the tubular members are preferably provided with holes or perforations so that any gas leaking from the main may diffuse through the sub-soil and accumulate in the adjacent tubular member or members. The latter are closed by readily removable inspection cover plates, and have located intermediate the ends thereof mesh partitions or screens for preventing ignition from external sources during an inspection of any gases that may have accumulated in the tubular members.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 9.]

Nos. 29,479—30,287.

Drake, J. W.—"Vertical retort settings." No. 29,933.
Drake, J. W.—"Charging apparatus for retorts." No. 29,934.
Drakes, Ltd.—See Drake, J. W. Nos. 29,933, 29,934.
Gibb, D. M.—"Automatic gas valves for water-heating apparatus." No. 29,685.
Green, R. W.—"Coal and coke breakers." No. 30,078.
Johnson, J. Y. (I. G. Farbenindustrie Akt.-Ges.).—"Low-temperature carbonization of fuels." No. 29,576.
Main, Ltd., R. & A.—"Open-flame gas radiators." No. 29,611.
Oulds, W. E.—"Gas-cooking stoves." No. 29,544.
Parkinson Stove Company, Ltd.—See Gibb, D. M. No. 29,685.
Wortley, G. W.—See Main, Ltd., R. & A. No. 29,611.

LEGAL INTELLIGENCE.

ASSESSMENT OF THE BATH GAS UNDERTAKING.

Appeal Fails.

On Friday, Oct. 4, at the Bath Quarter Sessions, the Recorder (Mr, R. P. Croom-Johnson) commenced the hearing of an appeal by the Bath Gas Company against the assessment of their undertaking by the Assessment Committee of the City of Bath.

Mr. Comyns Carr, K.C., and Mr. Trapnell (instructed by Messrs. Macdonald, Longrigg, & Pye-Smith) were for the appellants, and Mr. J. E. Singleton, K.C., and Mr. E. H. C. Wethered (instructed by the Town Clerk, as Clerk to the Assessment Committee) were Counsel for the Assessment Committee and the Rating Authority.

The appellants in their pleadings stated that the valuation of a gas undertaking is made from a consideration of the receipts and expenses, an allowance being made for what is generally called the "tenant's share." At the hearing before the Assessment Committee both the appellants' and the respondents' Surveyors submitted statements upon this basis, in which the figures for gross receipt and working expenses were very similar, the difference being in respect of the maintenance of works and mains and the tenant's share. The appellants contend that the method adopted by the respondents' Surveyor of calculating the tenant's share merely by the arbitrary percentage of the net receipts is without precedent and unconvincing, and that the proper method is to make an estimate of the amount of capital which the tenant would have to provide and to make an allowance thereon.

Respondents' Case.

In the course of respondents' pleadings, it was stated that the appellants were assessed at the rateable value of £11,911. In the valuation list in force prior to Jan. 31, 1929, the same hereditament was assessed at the rateable value of £9750. The appellants objected to the draft valuation list, and the Assessment Committee altered the rateable value to £10,476.

The respondents did not admit that the only question before the Court would be the proper allowance for the "tenant's share," nor that the only proper method of calculating the tenant's share was to make an estimate of the amount of capital which the tenant would have to provide, and to make an allowance thereon. Alternatively, if it were held that this was the proper method of procedure in principle in the present case, the respondents did not admit that the tenants' capital required was £180,000, or that the correct percentage was 15, as alleged, neither did they contend, as alleged by the appellants, that the principle to be adopted in fixing the tenant's share was to take an arbitrary percentage of the net receipts. They contended that, having regard to all the material factors influencing the rent which would enter into the mind of a hypothetical landlord and tenant, the true annual value of the said hereditament was not less than the sum of £10,476 as fixed by the respondent Assessment Committee.

Mr. Comyns Carr opened for the appellants, and the presentation of his case occupied an hour and three-quarters. The difference between the respective valuers in the figure they arrived at for gross receipts, less working expenses and maintenance of works and mains, he said, was not a large amount; their own valuers arriving at £34,973 and the valuers for the Rating Authority arriving at £37,606. Though the Company were of opinion that they could have sustained their figure against that of the Assessment Committee, the main point they were there to debate was a matter of principle to a far larger extent than any minor difference of mere accounts, that point being about the tenant's share.

Mr. Comyns Carr referred to developments by gas companies in providing for hire cookers, stoves, fires, &c., and also by encouraging the use of prepayment meters. There had to be provided by the tenant various utensils, which were generally hired out, but sometimes sold, and that required a great amount of capital. They said that £180,000 was a moderate figure for tenants' capital embarked in that particular undertaking.

The first witness, *John Alfred Southern*, of Messrs. Ryde, Sons, & Browne, of Westminster, Incorporated Surveyors, gave a mass of evidence of a more or less technical nature, and was for a long time under cross-examination respecting the various items appearing in the valuation he made on behalf of the Gas Company.

Maximum Charge and Dividend.

Witness, in re-examination, stated that the Company were limited to a shilling charge and to a maximum dividend of 5 p.ct., which was being paid.

Mr. Comyns Carr asked the position if a greater profit was produced than was sufficient to pay the 5 p.ct.

Witness: Subject to the reserves being up to the full mark, as they are now, they must reduce the price of gas to the consumer—hand it back; they have got to get rid of it.

Is that the reason why gas is very cheap in Bath?—Yes; and they have very economical management.

You spoke of the prices being increased at the end of 1926 (the strike year) to make up for the losses special to that year. As soon as that was achieved was it reduced again?—It was reduced, I think, in the course of the year, the last reduction taking place in April, 1928, down to the present figure of 5¾d.

Further questioned, *witness* stated that the cost of mains was increasing year by year, much damage being done by traffic. With the different method of making roads, it cost more to break them up and to reinstate them.

William Blundell, who has been Secretary of the appellant Company since 1919, gave a good deal of formal evidence respecting the Company's accounts and the items appearing in the appellants' valuers' valuation before the Court adjourned.

When the hearing was resumed on Saturday, Oct. 5, Mr. Singleton continued his examination of Mr. *Blundell*, who said the average age of the meters in use was eleven years.

In answer to the Recorder, the *witness* said certain repairs, amounting to a large sum, were necessary to be done, and put in the accounts.

Mr. Singleton asked witness if, in the last few years, there had not been expenditure out of revenue for repairs and renewals and a new gasholder.

Witness said that, with regard to the gasholder, the expenditure was in the nature of a contingency to the erection of the holder—such as sidings and other things.

The Recorder: These were preliminary works to prepare for the erection of the gasholder.

Mr. Comyns Carr ascertained from witness that certain cookers had been taken back by the Company and fitted with new attachments; and that there was no appreciable difference between such a cooker and an all-new one.

Mr. *George Evetts*, M.Inst.C.E., Consulting Gas Engineer, Westminster, then gave evidence.

Is the method of valuing, or arriving at a figure for repairs and maintenance, by multiplying the output of goods sold by so many pence per 1000 c.ft., a usual one?—Yes, having regard to the actual history of the Company in the past five years and looking at the prospects.

In his experience, said witness, he had known a case as low as 9d., but not in any of the companies with which he was connected. He had known one or two cases that were lower. The average figure would be from 11d. to 1s.

Mr. Comyns Carr remarked that the previous witness had mentioned a gross expense of £129,000, in one group, which did not include the cost of fixing any of the items on the consumers' premises.

Witness said he would himself add to the original prices, for fixing, 7s. 6d. per article. That would increase the net figure of cost (after deducting 33⅓ p.ct.) by about £8600 in the aggregate. Some three years ago he spent a fortnight looking into the Bath Gas-Works.

Mr. *Blundell* was recalled by the Recorder, and was asked to cast his mind back to the years down to 1925, and to say if he thought he could point to anything which would lead a hypothetical tenant to expect to pay less in 1928 than in any one preceding year. His reply was that he could not.

Witness added that in 1923 the assessment was £9073, and, in 1925, £9088. In 1927 the assessment was put up to £13,000, and it was agreed that this should be reduced to £9750.

Bath's Cheap Gas.

Mr. *Philip Michael Faraday*, Chancery Lane, London, a rating surveyor, was the next witness. He said he had not been over the Bath Gas Company's premises; in view of the modern form of valuation by accounts, he thought it was unnecessary.

The Recorder: As a result of your general experience, you say 17½ p.ct. is about right, but you have to consider the circumstances in a particular case? Have you conducted any investigation of accounts to form any opinon whether 15 p.ct. is sufficient or not?

Witness: Yes, sir, I think 15 p.ct. is fair and reasonable.

The *witness* made a notable statement: "Here the price of gas is almost lower than anywhere else in the country. The gross receipts are lower, and the tenants have a capital that is high in comparison." Answering Mr. Comyns Carr, he said that 9d. was very much lower than was fixed by many other companies.

Mr. Whimster's Evidence.

Mr. *J. Wesley Whimster*, Engineer and Manager to the Gas Company, stated that out of a schedule of about 150 patterns of cookers, only five were now obsolete. Whenever the cookers came in, they were re-conditioned, and up-to-date improvements were added.

Mr. *Claude Duncombe Conquest* said that the gross rateable value of the Bath gas undertaking was £12,206, of which £11,911 was in Bath. He explained how he arrived at his figures.

Mr. *Arthur Body*, Plymouth, twice President of the Rating Surveyors' Association, said that in this case it would appear that in the year 1928 there was an expenditure of £344 on ordinary meters (an extension) and on prepayment meters an expenditure of £961 (an

addition), together £1305. The result of that amendment was to make another £1300 available for distribution. Witness went on to show that he had now made a deduction of £27,702, because the items were not expenditures in the five years.

BUILDING UP A RESERVE.

It was quite common to make provision in the course of a prosperous year, regardless of whether that provision was necessary in that particular year or not, so that something in the nature of a reserve might be provided to cover the lean years when funds were not available. Witness also made a deduction of £2132 from depreciation for old meters. From automatic meters and cooking appliances he had first taken 40 p.ct. for depreciation, but as three-fourths of the cookers were more than 11 years old, there ought to be 50 p.ct. depreciation there. Altogether on the whole list the present depreciation came to £11,317, an addition of £2263. The witness then went on to allege that re-conditioned cookers were not equal to new, and that he himself had scrapped an old cooker and bought a new one in its stead for economy.

This point was disputed by Mr. COMYNS CARR, who said there were two cookers in the court for inspection and comparison.

The RECORDER, with Counsel, the witness, and the Company's Engineer then repaired to an ante-room to inspect the cookers.

Mr. COMYNS CARR pointed out that Mr. Body, in his figures, had only included £73 for stores; whereas Mr. Southern had allowed over £8000 under that head.

Mr. SINGLETON, in his speech, supported the assessment, Mr. COMYNS CARR holding that it should be reduced.

The RECORDER gave judgment dismissing the appeal, and stated that valuers had for a considerable number of years adopted a method which he might, perhaps, shortly describe as the gross profits method. He was satisfied it was the general method, and that it was, almost without exception, the method which had been adopted down to the present time and apparently without exception down to pre-war times; and he was satisfied that it was a fair, accurate, and proper method in cases in which there were no particular or peculiar circumstances. He should, therefore, deal with that case from that point of view, and he accepted that method. That method was put forward by the valuers for the Gas Company before the Assessment Committee. As he understood it, the resultant figures were not examined before the Assessment Committee in any great detail, and the Assessment Committee were persuaded by those who represented the respondents that another method ought to be adopted.

He adopted at that part of the case the contentions of the Gas Company, and he rejected the contentions of the respondents.

In their case, following the notice of appeal, the Gas Company accepted the figures of the respondents, and in answer the respondents, instead of accepting that situation, claimed first of all the right to re-open the figures, and in particular to revise the whole of the figures relating to working expenses and maintenance of the works and mains in the light of further information which might be available. For some time they claimed before him the right to conduct such an investigation. However, in the end, better counsels prevailed.

He could not part from that part of the case without expressing his very strong opinion that it was most inconvenient for a case to be conducted in a wrong manner before an Assessment Committee upon a certain basis of figures (even when a question of principle upon those figures was ultimately raised) and then for that to be entirely thrown over when the case came to an appeal, so that, as was seen in that case, it had become necessary to examine a number of matters (*a*) upon which the Assessment Committee had never had the advantage of making a real investigation, (*b*) upon which the valuers for the Assessment Committee (in the view which they took) did not appear to have made any of the detailed inquiries which they made after the appeal had been launched.

The next question he had to consider was the tenant's capital. Here, again, he repeated, it was unfortunate, in view of the attitude taken up by the valuers for the respondents, that that matter was never investigated, at all events in any detail, before the Asesssment Committee, and the result was that the officials of the Gas Company had had to explain to him their case without having had the advantage, which he thought they would otherwise have had, of having a beforehand knowledge of the sort of criticism which the witnesses for the Rating Authority would have made before the Assessment Committee, so that they might see what was the sort of information they ought to supply him with. He was satisfied that the officials of the Gas Company had done their best to furnish all information which might reasonably and properly be required in the matter.

Tenant's capital meant, as he (the Recorder) understood it, the amount which was reasonably required by the tenant for the apparatus, &c., for the purpose of carrying on the works which he was supposed to have rented from the owner of them.

It was to him a distasteful thing to have to consider which of two sets of expert witnesses he had to accept as giving him real guidance. He had come to the conclusion there that Mr. Body, a witness for the respondents, had had experience (at least equal, if not greater than the witnesses for the appellants) in going into these matters of tenant's capital. He was very much impressed by the way in which Mr. Body gave his evidence and his reasoning.

He had come to the conclusion that in substance he must adopt Mr. Body's figure, but he (the Recorder) had also himself conducted upon the whole of the evidence a detailed examination, and independently arrived at a figure as the amount of the tenant's capital.

That being so, the next stage in the case was reached, in which a calculation had to be made, based on that figure, to ascertain what was the rateable value of the entire Undertaking, and in the result the figure which had been found by the Assessment Committee was arrived at. The result of this was that the appeal failed and must be dismissed.

Then there came (in the peculiar circumstances of that case and the way in which the case was taken) the question of costs. He was satisfied (1) that a great deal of the time taken there had been taken up by reason of the fact that the regular practice and principle was not adopted, and (2) that the figures might have been investigated below with consequential lightening of the burden of those who had to present the Gas Company's case. And he had come to the conclusion about it—substantially the Gas Company failed, and he thought, therefore, substantially they ought to pay some costs; but he could not help feeling that if the respondents had accepted the indication made in the case for the Gas Company that the only point to be decided was this, "what is the tenant's capital," it was conceivable some agreement might have been arrived at, and that the whole appeal would have taken a very much less time.

As a great question of principle had been raised by the respondents, it was obvious they, the Gas Company, were entitled to present their case with all the advantages which such a point ought to have; and for that purpose they instructed leading counsel. His own feeling about it was that if that case had proceeded upon normal and ordinary lines of an appeal against an assessment upon a gas undertaking, it could have been disposed of in very much less time. And as it had taken something like seventeen actual hours of public time, in these circumstances he had come to the conclusion that the proper order to make was to order the Gas Company to pay one half of the taxed costs of the respondents, and he did not make an order for more than one counsel.

AFFAIRS OF MR. FREDERICK W. LENNARD.

At Bankruptcy Buildings, London, W.C., on Oct. 17, the first meeting of creditors was held of Frederick William Lennard, 1-6, Regnart Buildings, Euston Street, London, Engineer and Contractor, carrying on business as S. Pontifex & Co., and also at 34, Eagle Street, High Holborn, W.C., under the style of Harold Cooper & Co., Wrought Iron Works, and at 1-6, Regnart Buildings, Euston Street, under the name of T. S. Borrodaile, Gas Regulator Manufacturer.

The receiving order was made on the debtor's own petition on Oct. 4. He roughly estimated his liabilities at £3000, and scheduled assets to the value of £5880. He attributed his failure to lack of capital. It appeared from his statements in preliminary examination that 34 years ago he entered his father's employ in the business of engineers and contractors carried on under the style of S. Pontifex & Co. He was subsequently taken into partnership, which continued until the death of his father in 1911. The debtor then entered into partnership with his brother, Thomas W. Lennard, and they traded together until 1914, when his brother retired from the business, and the debtor paid him £6000 spread over a period of three years. The debtor had since carried on the business alone, but the payment to his brother had been a great drain on the resources of the firm, and he had since striven to keep the business going. In addition, he had to pay £300, free of income-tax, to his mother, under the terms of his father's will, and he had also made a few losses on contracts. Several creditors recently pressed for payment, some of whom obtained judgments, and in two cases execution had been levied.

In 1914 he and his brother bought a business at 34, Eagle Street, High Holborn, W.C., which was still being carried on under the style of Harold Cooper & Co. This business also passed to the debtor on the dissolution from his brother. There are about twelve employees at this address, and the business is a very prosperous one, and is thoroughly solvent.

After Mr. E. Parke (Official Receiver) had dealt with the proofs of debt, the meeting passed a resolution for the appointment of Mr. Alan Chas. Lucas, C.A., 167, Strand, W.C., as trustee of the estate, with the assistance of a committee of inspection. The trustee's security bond was fixed at £4500.

LIBEL ACTION.

Berg *v.* Electrolux, Ltd., and E. D. A. Herbert.

A settlement was arrived at before the Lord Chief Justice in the King's Bench Division on Oct. 15 of the action for damages for libel entered in the list as "Berg *v.* Electrolux, Ltd., and E. D. A. Herbert."

Appearing for the plaintiff, Mr. Levy said the action was for alleged libel and slander. Mr. John Gustav Berg, the plaintiff, was well known in the electrical and gas industries throughout the world. He had been engaged at a substantial salary by the defendant Company. Some six months or so before October, 1928, Mr. Herbert became Managing Director of the defendant Company, and differences arose between him and Mr. Berg which made it clear that they could not work together. Mr. Berg decided to resign as soon as Mr. Herbert had become sufficiently in possession of the details of administration, and he did so in October, 1928. It was not long afterwards that Mr. Herbert published the alleged libellous document. The suggestion made was that Mr. Berg's dismissal followed misconduct on his part. It was now desired emphatically to refute that suggestion.

Terms of settlement included the publication of a document to the effect that Mr. Berg had been engaged by Electrolux, Ltd., for 3½ years, and his conduct had been eminently satisfactory. As a result of a change of policy his agreement as Executive Manager of the Company was determined, and no reflection was cast on his integrity or ability. He would be paid £150, and the defendants would pay his agreed costs amounting to £520.

Mr. T. de la Poer Beresford assented to the settlement for the defendants, and the record was withdrawn.

MISCELLANEOUS NEWS.

GAS POISONING COMMITTEE.

Further Evidence.

Further evidence was heard last week by the Committee appointed by the Government to consider the increase during recent years in the number of deaths ascribed to poisoning by coal gas supplied for domestic purposes, and to make recommendations as to measures which might be taken with a view to diminishing the number of such deaths. (The previous evidence was published in the "JOURNAL" for Oct. 16, p. 185.) The Committee consists of Sir Evelyn Cecil (Chairman), Sir John Robertson, Prof. R. V. Wheeler, and Mr. F. J. Wrottesley, K.C.

Tuesday, Oct. 15.

The only witness who gave evidence on Tuesday was Mr. E. J. Silcock, M.Inst.C.E., a member of the Council of the Surveyors' Institution, and Chairman of a Special Committee set up by the Surveyors' Institution to report on the causes of explosions and bursts in mains under roadways. His evidence included a summary of the results of the Committee's inquiries, and concerned the possible dangers arising from gas leakages underground, and suggested methods of eliminating or diminishing these dangers.

He admitted that his own experience was mainly connected with the laying of water mains and sewers, and that he had no direct connection with gas-works or the gas industry, but he added that in the course of his work he had ample opportunities of observing the condition of gas mains and the frequency with which there was evidence of escapes of gas in the subsoil of roadways.

The Committee set up by the Surveyors' Institution, to which he had referred, he said, was appointed early in 1929, soon after the explosion in Holborn, and had reported to the Council of the Institution on May 27 last.

Summarizing the Committee's findings, he referred to the new methods of road construction, necessitated by modern traffic conditions, which had in turn affected the conditions of the underground pipes and mains. The necessity for very heavy and thick concrete foundations in many cases, combined with the lowering of the crown of the road to reduce the camber, had brought the road structure nearer to the underground pipes, and so had reduced the cushion of earth between the pipes and the road traffic, so that frequently large pipes were within a very few inches of, if not actually embedded in, the concrete supporting the road surfaces. The removal of this cushion of earth between the pipes and the concrete had led to the direct transmission of vibration due to the increased speed, weight, and number of vehicles using the roads.

The CHAIRMAN said he believed that an experiment in which some special road material was being used was being conducted near Blackfriars Station, in London.

Witness said he knew nothing of that.

Discussing other causes operating in many of the streets, he referred to the repeated opening of the subsoil by excavations for mains and pipes, the removal of the lateral support of the subsoil of the road by the foundations of new buildings carried to great depths, and the deterioration of cast-iron and steel mains through the fatigue to which the metal is subjected. All these involved greater risk of fractured mains and defective joints than formerly was the case.

The CHAIRMAN suggested that when a new building was erected the lateral support previously afforded by the subsoil was restored by the foundations.

Witness replied that several years elapsed before the settlement was complete, and during that time slight movements occurred which led to the opening of the joints of mains.

In spite of these causes, he continued, there did not seem to be any marked increase in the total number of failures of mains through bursts or breakages; but there were indications that the cumulative effect of these various circumstances had produced a slight increase in the amount of gas which escaped into the subsoil. It seemed almost impossible to avoid entirely the escape of gas from the mains under all conditions, and the presence of gas in the subsoil of roads and streets must be accepted as a usual condition. That was the conclusion of the Committee as well as his own.

The CHAIRMAN said it appeared that all the changes that had been effected did not make a very great deal of difference, but just a slight increase in leakage.

Witness agreed, but added that they were bound to consider these contributory causes, which rendered leakage more liable to occur than had been the case in the past. On the whole, however, the mains seemed to have withstood the strain very well, and the total number of explosions and leakages, and openings made to detect leakages, did not seem to be substantially greater than it had been.

TRACING GAS LEAKAGE.

The increased difficulty of tracing gas leakages, due to the impervious road surfaces preventing the escape of gas through the subsoil to the air, was also referred to; and witness pointed out that, whereas in the older form of road any gas escaping from mains could escape from the subsoil through the interstices of the surface material, so that a small leak was almost imperceptible, and did not matter very much, it was unable to escape in that way at present. Owing to increased traffic, it had become necessary, especially in thickly populated areas and towns, to widen roads and carriage-ways; and unpaved forecourts and strips of front gardens in front of buildings, which previously had formed natural outlets for gas which had escaped from mains, were now parts of the roads, and were paved. Owing to the covering up of such outlets, gaseous mixtures tended to accumulate in any conduits, disused sewers, or subsoil cavities or chambers; and these became potential sources of danger. Not infrequently the gas travelled considerable distances under the road foundations. In many cases it reached the basement walls of buildings adjoining the streets, and thence percolated through the brick walls into the basements; and in his view the escape of gas into the interior of houses in this way was more liable to occur now than formerly. Leakages of gas were more difficult and costly to locate.

The CHAIRMAN asked if it were his conclusion that nowadays the escape of gas could not be avoided altogether, however carefully the mains were constructed.

Witness said that the Committee had stated that it was impossible to eliminate entirely the escape of gas, though, he added, it had not stated that the position could not be improved.

The CHAIRMAN: If mains cannot be constructed more carefully, we must look in another direction?

Witness said there was still room for improvement. The jointing was carried out more carefully to-day than formerly.

The CHAIRMAN: You think the jointing is now very good?

Witness: It is fairly well done.

He added that the high-pressure mains were tested very carefully. Undoubtedly the older gas mains did leak to a considerable extent at the joints, and it was notorious that all gas companies had a substantial gas loss in the course of a year through leakage.

Asked by the Chairman if the percolation of gas through the brickwork of houses occurred often, witness said there were records of a number of cases in which gas had escaped into houses in that way and had caused explosions, and he believed people occupying basements had been poisoned by such escapes. He had no statistics, but he believed it was well understood by those connected with the gas industry.

The CHAIRMAN said he wanted to get some idea of the frequency of this occurrence, and asked if, for instance, it happened more often than not.

Witness: Oh, no.

The CHAIRMAN asked whether he considered that leakage from mains under roadways, caused by vibration set up by the traffic, was sufficiently serious to warrant the Committee trying to find a remedy.

Witness said he did. The Committee of the Surveyors' Institution had considered that some provision should be made for the adequate ventilation of the subsoil under roads, to compensate for the loss of ventilation due to the impervious nature of modern road surfaces. With this view he was fully in accord—indeed, his own individual opinion was even stronger than that of the Committee as a whole. Admittedly this was a most difficult problem to solve. It involved the provision of definite outlets from the underside of the road foundations to the open air, and these outlets must be at frequent intervals to afford efficient ventilation. Gratings in carriageways were objectionable, owing to the difficulty of making them of a metal which would wear down at the same rate as the road surface, and it was desirable, therefore, to reduce the number of such openings to a minimum. On the other hand, gratings in the footway or in the kerb would be equally objectionable, and would bring the gas nearer to the buildings than if the gratings were in the carriage-way. Possibly lamp columns in street refuges might be utilized as outlets, or special columns might be erected for the purpose along the edge of the footpath. Designs had been prepared showing methods of ventilation in the carriage-ways; and illustrations could be shown to the Committee. The problem had not hitherto been considered seriously, but it was one to which he attached great importance.

In addition to the openings through the road, it would be necessary to fill in the trenches over large gas pipes with bricks, stones, or other material which would allow the passage of gas to take place towards the openings, or, in the case of important high-pressure gas mains, it might be possible to have definite pipe connections from one pipe joint to the next, these pipe connections being carried to the point of outlet to the air.

The CHAIRMAN asked if the Committee of the Surveyors' Institution had considered this proposal very seriously, or had merely put it forward as a matter for inquiry.

Witness said that the Companies did not put forward any definite method of dealing with the proposition itself; they had expressed the view that it should be done. It was up to the gas industry to find a way out of this difficulty. Men had been working on the road in Victoria Street for months, and he did not think it was an exaggeration to say that Victoria Street, the Sanctuary,

and Abingdon Street had not for three years been clear of men looking for gas leaks. If, when these operations had commenced, they had adopted the practice of placing gratings along the lines of the pipes, they would not have to employ workmen in the streets again and again. If a leakage occurred, they would be able to locate it more easily than if there were no gratings, by testing the gas emitted from the gratings. A gas detector indicating the proportion of gas to air could be used, and the grating which emitted a mixture containing the greatest proportion of gas would be the nearest to the leak.

Improved Mainlaying Needed.

It was also desirable that improved methods should be adopted in the laying of gas mains. It was recognized, he believed, that gas undertakers in the past had not been so careful in the selection of materials and the supervision of workmanship as they might have been, and that the amount of gas escaping from the mains of the older gas undertakings was greater than in more modern works. The pipes should also be laid at a greater depth, and in his view there should be a cover of not less than 3 ft. between the top of the main and the bottom of the road foundation; for important high-pressure mains, even this depth should be exceeded.

Asked if he had considered the additional cost involved in making the improvements suggested, he said he did not consider that the additional cost was worth consideration if the cost which had to be incurred in detecting leaks in present circumstances could be reduced.

The Committee of the Surveyors' Institution had also concluded that it would be desirable for local authorities to have additional powers to control the laying of all underground pipes and conduits within their areas, and, further, that the operations of statutory undertakers should be co-ordinated so that when road surfaces were being re-made, existing mains could be re-adjusted and new mains laid in suitable positions. There was great difficulty, he said, in getting the various undertakers to co-ordinate their operations, and some streets were so full that when new pipes had to be added they had to be placed below those already existing. As a result, the upper pipes might be undermined and subsidence might occur.

The Chairman asked if experiments had been made to test the value of the remedies suggested by the Committee of the Surveyors' Institution.

Witness would not go further than to say that they were pious opinions; but he added that they were made by men of experience in dealing with the difficulties mentioned.

The Chairman: You cannot point to any place where these suggested remedies have been put into practice?

Witness said he believed the gratings were being used in some places. The general practice to-day, of course, was to lay pipes at greater depth and in a more systematic manner than formerly, the materials and jointing were better, and practically all the pipes used by the big undertakings were made to standard specification.

Asked by the Chairman whether the addition of some "stinking" constituent to gas, in order to make its presence more evident by smell, would be a possible remedy, he replied that the ordinary sensitive nose of the normal person would detect a very small escape of gas in present circumstances.

Prof. R. V. Wheeler, referring to the report of the Committee of the Surveyors' Institution, asked what use had been made of it.

Witness said it was addressed to the Council of the Institution, and copies had been sent to all public departments, and, he believed, to local authorities. He could not say whether or not it had been acknowledged.

A number of questions were asked by Prof. Wheeler as to whether the Committee had considered new methods of road construction by the adoption of which the difficulties experienced in dealing with leakages from mains would be overcome. Witness replied that the present methods of road construction were introduced to meet the needs of present-day traffic, and the roads were in such good condition that he did not think it was likely there would be any immediate change.

Prof. Wheeler said that surely witness would not call the present method of construction perfect, for the roads had to be broken up when pipes had to be attended to, at enormous cost. Could not the Surveyors' Institution think of some better method than that?

Witness replied that one never reached perfection. He did not doubt that the Institution had had the matter in mind, but he doubted very much whether they would be likely to make any suggestions of new methods at the moment.

Asked why an escape of gas was not always detected by smell, he said he imagined that in such cases the escape must have been gradual, and that the people in rooms in which it had escaped had become accustomed to it before it had become dangerous.

Prof. Wheeler, pressing further the point that there must be a better method of construction of roads than that adopted at present, said that it seemed to him that the Committee of the Surveyors' Institution had been placing the onus on the wrong set of people, and that the surveyors should devise better methods of road construction, so as to allow the inevitable leakage of gas, to which reference had been made, to escape.

Witness replied that this was asking them to take a retrograde step. They had been asked to improve road surfaces, and he claimed that road surfaces to-day were better than they had ever been before in this country.

Questioned with regard to the use of steel mains, witness said they were used for carrying water, but he did not think they were employed very much for gas, except in the case of high-pressure mains. They had not been in use for a sufficient length of time to enable definite evidence to be obtained as to their service, but he had found cast-iron pipes in good condition after having been in the ground for 50, 60, or 100 years, and had known cases in which steel pipes had not lasted for more than a few years. The steel was so thin that a very small amount of corrosion reduced the strength. They were used for water where pressures were very high, on economic grounds; and where they were protected by a thick bituminous or cement lining, they might be all right.

He agreed with Prof. Wheeler that where steel pipes were used the distance between joints could be greater than when cast-iron pipes were used.

Asked for a further explanation of his suggestion that, if outlets were adopted to enable gas to escape from beneath the roads, it might be possible to have pipe connections from one pipe joint to the next, which connections could be carried to the point of outlet to the air, he said he had in mind a perforated pipe running alongside an important main, into which pipe any leakages of gas from the main would be driven.

Asked if he would advise the Committee which body it would be best to approach with regard to methods of road construction, he suggested the Ministry of Transport.

Sir John Robertson, having ascertained witness's view that leakage of gas from mains was due in most cases to drawn joints, caused most frequently by movement of the subsoil, asked whether fairly thick collars of plastic clay round the caulked joints would prevent leakage.

Witness thought not, because the clay would dry and crack.

Asked if gas was more likely to get into dwelling-houses in areas where there was much clay than where the soil was more porous, he said the porous material would be more likely to allow the passage of the gas, but it was found, in clay formations, that in very dry weather the clay cracked, the cracks being sufficiently wide to allow the passage of gas through them. He could not reply to a question as to whether the objectionable odour of gas was removed to any extent by its passage through soil.

Replying to Mr. Wrottesley, he said he did not know of a case in which gas had contaminated a water supply.

Questions were asked by Mr. Wrottesley as to who was to bear the cost of ventilating the roads in the manner suggested, and, having ascertained witness's view that it should be borne by the gas undertakers, he pointed out that the cost must be passed on to the consumers; and he asked if the mischief at present was sufficiently acute to justify the increase of the cost of gas to the consumers. Mr. Silcock reiterated that he did not think the cost would be appreciable. A small grating, which would probably not cost more than £1, would be sufficient.

Mr. Wrottesley said that the installation could not be done at a cost anything like £1 per grating, unless it was done when roads were under repair. Then the road authorities would not like the gas companies to instal the gratings themselves.

Witness agreed. He had in mind that the installations would be effected over a period of years, as and when road works were being carried out. If a road authority were providing a new foundation, it should put in gratings supplied by the gas undertakers.

Some surprising evidence was given by Mr. Silcock as to the practice of gas undertakers in regard to the keeping of records as to the positions of their mains. It arose out of a suggestion by Mr. Silcock that the gratings, being immediately over the gas mains, would simplify the location of mains. Mr. Wrottesley immediately asked if gas undertakers had not plans already, showing where the mains were, and Mr. Silcock replied that they had not, and that such plans could not be made. Pressed further, he said that probably the foreman in each district knew within a yard or two where each of the mains was, but he would think that there were very few places indeed in the country where anything approaching a reliable record as to where the pipes were was in existence.

Replying to further questions, witness suggested that the trenches above the pipes should be filled with broken stone or bricks or other hard material, having interstices through which the gas which escaped could travel to the gratings.

Asked how the gas and water undertakings compared from the point of view of their standards of workmanship and materials, he expressed the view that the water undertakers were the more careful, probably for the reason that if the work were not done properly they would soon be found out, because leakages became obvious at once.

Mr. Wrottesley asked if anybody had worked out the cost to gas, water, and sewage authorities, over a term of years, of carrying-out repairs in streets such as Piccadilly and the Strand under present conditions, in order to estimate whether it would pay the community to substitute subways.

Witness replied that it had been worked out very carefully, and it was found that it did not pay. A subway was not really a cure for the malady, unless there was one on each side of the street, because of the services.

Asked if allowance had been made, in these calculations, for the inconvenience to the public, damage to trade, and so on under present conditions, he said he did not think it could be translated into money.

Discussing the suggestion that local authorities should be given more power to control the laying of pipes and to co-ordinate the operations of statutory undertakers, Mr. Wrottesley suggested (and it was admitted by Mr. Silcock) that the Committee which had made the recommendation was strongly municipal, and that local authorities might use their powers in such a way as to become oppressive to other occupiers of the roads. Mr. Silcock agreed that the problem was difficult, but the Committee had been driven to the conclusion that there should be some authority with the necessary powers, and, having got that far, they had also concluded that the local authorities should have them.

Mr. Wrottesley said he gathered tthat the Committee of the Surveyors' Institution had not been very much impressed as to the evidence of leakages of any serious nature into houses.

Witness agreed, but said it was thought that leakage into houses was more liable to occur now than formerly.

Mr. Wrottesley: Did you have evidence that it was in fact occurring more frequently?

Witness: No.

Mr. Wrottesley, examining the statistics, said there was nothing

very striking in them to indicate that there had been more accidents in the last few years through the leakage of gas into houses than there were formerly.

Thursday, Oct. 17.

Dr. Samuel Ingleby Oddie, Coroner for Westminster and for the South-Western Division of the County of London (a position he has held since 1912), said that during this period he had held some 16,000 inquests, of which 1725 related to suicides. Of the total number of suicides, 249 were due to the use of domestic gas, and only 34 deaths during the same period were due to accidental poisoning by domestic gas. While deaths from accidental gas poisoning remained fairly constant throughout the period he had mentioned, witness said that the suicides from the use of gas showed a remarkable and steady increase year by year. Thus there were 4 gas suicides in 1914, 11 in 1921, 27 in 1923, and 38 in 1926, while up to date this year there had been 30.

The Chairman asked when this increase began to be noticeable.

Witness said it had come about gradually up to 1921, when there had been a big jump, and then the number had continued to rise as shown by the figures he had mentioned. These figures related solely in those cases where the verdict had been one of suicide on the part of a jury; but there had been a number of cases returned as accidental which, he was certain in his own mind, had been cases of suicide. Therefore, the figures reported as suicides were under the mark rather than over the mark.

Continuing, Dr. Oddie said that the heavy increase in the number of suicides by gas was evidently due to the far greater use of domestic gas for cooking and heating during recent years, which had rendered the process of committing suicide by gas much more easy and certain. Formerly gas was used only for lighting purposes, and it was by no means so easy then to commit suicide by gas as it was at the present time. Deaths from accident due to coal gas were very rare; and Dr. Oddie said he had no doubt that juries sometimes took the view, from sympathetic motives, that deaths were accidental, thus swelling the figures of accidents and reducing those of suicides.

The more usual deaths from accidental causes from gas poisoning were loose taps turned on by accident at stoves and brackets, and defects in old fittings. The sliding chandelier was also another cause, though not many such apparatus existed now. He was not aware of any accident in his district through two families using the same prepayment meter. He had, however, had a few accidental deaths from split pendant pipes, due to age and defective welding, and one or two from cracked mains in the street allowing gas to creep through the subsoil into houses.

The Chairman asked if Dr. Oddie thought these causes of accident could be removed, or whether modern fittings and apparatus were safe and adequate.

Witness said that as a general rule undoubtedly modern fittings and apparatus were safe, and he had found that nearly all cases of accidental deaths due to defective fittings related to privately-owned fittings which were not regularly inspected by the gas company. They were fittings which had been bought many years ago and had not been inspected or kept in repair. Where the gas company regularly inspected the fittings there did not appear to be fatal accidents from the causes he had mentioned.

The Chairman: "That is one of the points this Committee has been asked to inquire into. As a rule, you think gasfittings are kept in good order, and are safe?

Witness: Yes.

Answering questions with regard to accidents from cracked gas mains, Dr. Oddie said he knew of such a case in Wandsworth on one occasion, the accident happening through frost, and gas leaking through the subsoil into a house farther away. That was also a case of an old road upon which there was a great deal of heavy traffic. Such cases, however, were very rare.

Referring again to suicides by coal gas, Dr. Oddie said that, whereas during the time he had been Coroner only one out of 26 suicides in his district was due to gas in 1914, no fewer than five out of 26 were due to that cause in 1927 and 1928, while in 1929 it seemed that the figure would be 3 out of 26. He added that drowning was responsible for the largest number of suicides in his district, poisoning by such things as "Lysol" coming next, and gas poisoning after.

Continuing, Dr. Oddie expressed the opinion that no variation in the constituents of coal gas would affect the number of suicides from that cause. People who had made up their minds to kill themselves would do it somehow; and he did not think any good purpose would be served by any limitation of the water gas content of domestic coal gas.

The Chairman remarked that the Committee was sitting to consider the increase of deaths due to poisoning by coal gas supplied for domestic purposes, and he gathered that the witness did not think that the constituents of gas played an important part in the question of the reduction of suicides by gas.

Witness said that was so. The question of ventilation now did not come into the matter as it did years ago when gas was only used for lighting and people had to stuff up the keyholes and window crevices in order to get the room filled with gas. Now the suicide placed his head in the gas oven, or lay down with a gas ring beside him, and swallowed the gas in its undiluted state.

The Chairman referred to a cutting from a daily paper which reported the Hackney Coroner as saying that suicides by gas were becoming increasingly common and ascribing one factor in the situation as being the publicity given to similar cases creating a desire on the part of another person to do the same.

Witness said he agreed entirely. Undoubtedly the reports of cases of suicide by gas poisoning were an incentive to certain people who were suicidally minded.

Prof. Wheeler asked whether, as the result of evidence that had been given in his Court, Dr. Oddie had been able to arrive at any conclusion as to the limit of time during which the gas was inhaled before death took place.

Witness said he had not, because in most cases the person when found was dead and the gas was still escaping. Answering some questions as to juries being sympathetic, Dr. Oddie said that, though he now held inquests without a jury, he remembered early cases where the jury had gone against his direction and brought in a verdict of accidental death when, in his opinion, all the evidence pointed to suicide. Speaking generally, he added, the total number of cases of suicide had not varied very much in his district over the period he had been Coroner, being round about 100 per year, so that the increase in the suicides by gas was due not to an increase in the total number of suicides, but to a change in fashion.

Prof. Wheeler remarked that this conflicted with the general evidence that had been given to the Committee, which suggested that there had been an increase in the total number of suicides in recent years, and that this increase had been due to coal gas poisoning.

Witness said that this was not borne out by the figures relating to his district.

Answering some questions concerning the view expressed earlier that no good purpose would be served by a limitation of the water gas content of domestic gas supply, Dr. Oddie said that the proportion of CO was important when there were only gas burners and a room had to be filled with gas before a person could commit suicide. Now this was of little importance, because, as he had already said, the gas was usually swallowed in large quantities either in a gas oven or from a gas ring or fire.

Sir John Robertson put some questions as to whether there were more suicides in working-class districts than among better-class people.

Witness agreed that the tendency was that way; and he was inclined to attribute it to the fact that—apart from financial troubles and drink—as all suicides were suffering from some form of insanity, the better-class people were looked after by medical attention and prevented from suicide, whereas in the case of working-class people no attention was paid to them at all. He saw no means of remedying this state of affairs. In his district there were more suicides by drowning than gas poisoning, and he attributed this to the presence of the River Thames, though he understood that generally throughout the country drowning now took second place to gas as a means of suicide.

Mr. Wrottesley, K.C., commented on the fact that in Dr. Oddie's district the number of cases of accidental death from gas poisoning was decreasing while the use of gas was increasing enormously for domestic purposes.

Witness, answering some questions with regard to accidental deaths from geysers, said his experience had been that these always happened when the geyser was defective or the ventilation was deficient.

Mr. Wrottesley asked Dr. Oddie whether from his experience he felt there was anything which would justify asking for further precautions with regard to the nature of the gas now supplied to the public.

Witness replied that there was not, though if that question had been asked him ten years ago he would have given a different answer. From the point of view of accidental gas poisoning, he had no fears now whatever; while nothing would prevent a person committing suicide if he determined to do so.

The Committee adjourned until Tuesday, Oct. 22.

COOKERY DEMONSTRATIONS AT BRIGHTON.

Opening of Autumn Session.

The Autumn Session of free lectures and demonstrations in gas cooking commenced on Oct. 15 in the Brighton and Hove General Gas Company's cookery room, 115 and 116, Church Street, Brighton.

During the past seasons, these lectures have proved an invaluable help to harassed housewives, and on the opening day there was another large assembly to see just what is the latest and cheapest way of preparing hot meals. They were soon enlightened by Mrs. E. Iredale, who, with her two assistants, Miss D. N. Taylor and Miss E. J. Gott, will once again demonstrate this season. Mrs. Iredale knows that it is a sheer waste of gas and time to put the tap on at full in the blissful belief that the flames up the side are going to get the contents done more quickly. What is needed is a comparatively low flame directed in the proper place. To prove her theory, she cooked a dinner suitable for six persons with twopennyworth of gas. With such facts and figures fixed firmly in their minds, it was an enlightened band of housewives who finally dispersed.

Prior to the demonstration, Mr. P. E. Browne, the Distribution Engineer, welcomed the gathering on behalf of the Company.

During the autumn the lectures will be continued on Tuesday and Thursday afternoons and Wednesday evenings.

Tar Oil Spraying.—Under the auspices of the Evesham and District Market Gardeners and Fruit Growers' Association, a lecture was given last week by Mr. Theodore Parker, of the Paddock Wood Research Station, on "The Principles and Practice of Tar Oil Spraying," at the Town Hall, Evesham. Mr. E. J. Masters, who presided, said the importance of tar oil washes and winter spraying had been brought to their notice within the last few years. It was something that should be looked into, and all should realize the important bearing it had on the success of the market gardening industry. Mr. Parker said the woolly aphis could be controlled by tar oil wash. Tar oil washing appeared to stop brown rot in some indirect way.

GAS AT THE NORTH-EAST COAST EXHIBITION.

Some Impressions of an "Evening Chronicle" Correspondent.

How do they cook the 10,000 meals or more which are prepared every day at the North-East Coast Exhibition? What keeps the monkeys warm? How are the chickens hatched in the incubation exhibit? What fuel is used in that marvellous oven of Crosby's which can turn out 3000 to 4000 cakes an hour?

I found the answer to all these questions, and many more, during a recent tour of the Exhibition. My object was to find out what one commodity, gas, has done for exhibitors and public alike, and I was amazed by the variety of its uses.

No Smoke.

In the first place, it was pointed out to me that no smoke rises from the vast group of exhibition buildings.

Visitors to the Exhibition who come from the Industrial North may not see anything unusual in the smoky atmosphere of the town, but those from further afield have expressed their surprise at the griminess of its buildings. Grey Street, for instance, with its noble curve, is one of the finest streets in the country; yet the deposit of soot on the buildings detracts greatly from its beauty. There are buildings in Newcastle as fine as any in this country, but they are hidden under a layer of soot and grime.

A striking contrast to this is provided by the Exhibition itself, with its light-coloured buildings, from which not a trace of smoke arises. I was interested to discover the reason of this, and found that the whole of the cooking and water heating is done by gas.

Ten Thousand Meals a Day.

This, the first of its services in the Exhibition, is one of enormous importance. With an average of 20,000 visitors a day requiring refreshment of some sort, and over 10,000 actual meals to be cooked, the extent of the use of gas can be imagined. Ten thousand meals a day sounds enormous, but when Messrs. Lyons & Co. were entrusted with the whole of the catering at Wembley, they had to provide 100,000 meals a day, and they relied entirely on gas for this vast undertaking.

At Messrs. Crosby's stand is a travelling high-pressure gas oven, the first of this type ever constructed for baked confectionery—cakes, biscuits, teacakes, and the like. It will turn out 3000 to 4000 ordinary three-ounce cakes an hour. The rate of the travelling trays can be adjusted so that the operation lasts anything from ten minutes to an hour. The use of gas for baking is making it possible to turn out thousands of loaves, cakes, and biscuits an hour, and in less space and with less labour than before.

There is also gas equipment—cooker, refrigerator, and geyser—in the model kitchen at the Empire Marketing Board Pavilion, where more than 40,000 cooking demonstrations have already been held.

From here a general tour of the Exhibition impressed me with the multiplicity of the uses of gas. First to the Amusement Park, where gas is used for illumination, for incubating the chickens, and even for keeping the monkeys warm!

Then on to the Palace of Industry and Engineering, where I found it used for bootmaking, coffee roasting, baking, tar melting, sweet making, printing, toffee making, stereo melting—and dozens of other uses.

The gas stand in the Palace of Engineering has a striking display of the uses of gas in industrial processes. Here there are, among others, gas-fired furnaces for heat treatment of metals and case-hardening, a die-casting machine for the production of all classes of "white metal" articles, and a complete assortment of gas-heating burners for use in a thousand-and-one ways, from the tiny one for heating a kettle to the one for heating a 500-gallon vat.

Public Interest.

The stands of the Newcastle-upon-Tyne and Gateshead Gas Company and those of the gas appliance manufacturers form a striking group in the Palace of Industries, with their uniform colour scheme of crimson, black, and buff. Here I obtained convincing proof of the public interest in gas. More than 40,000 inquiries have been attended to on these stands; 6394 people have attended the cookery demonstrations; 6475 have attended the laundry demonstrations, while 1525 have been attracted to the Ideal Kitchen.

My tour of the Exhibition led me suddenly to think, "What would happen if the gas supply suddenly failed?" Think of it—the service of meals and refreshments in all the restaurants would cease, the amusement park would be unlighted, over 60 firms hampered in, or even prevented from, fully demonstrating the uses of their products, no cookery demonstrations! The prospect is alarming. It says much for the reliability of gas that the Exhibition authorities put so much trust in it.

T. W. B.

REFRACTORY BRICKS AND TILES.

Application for Marking.

An application has been made to the Board of Trade under the Merchandise Marks Acts, 1926, for an Order that imported refractory bricks, blocks, and tiles should be marked with an indication of the country of origin; and the Committee appointed under the Act, consisting of Sir H. Llewellyn Smith, K.C.B. (Chairman), Mr. F. R. Davenport, and Mr. G. N. Barnes, began consideration of the application at the Offices of the Board of Trade on Monday, Oct. 7, and continued the inquiry on Tuesday, Oct. 8, when it was adjourned for a week. The application also includes ordinary building bricks and tiles, and this part took up the greater part of the first two days of the inquiry.

The application is made by the National Federation of Clay Industries, which has a membership of 500 firms, including the majority of brick and tile manufacturers in Great Britain; but the application is also supported by a number of firms who are not members of the Federation. Opposition is offered by a group of importers who have joined together for the present purpose, and are represented at the inquiry by Mr. Malcolm Hilbery, K.C., while there is also opposition from the National Federation of Building Trades Employers, who are, however, concerned with building bricks and tiles.

The reason for the present application is the large increase in the number of bricks and tiles which have been imported into this country during the past ten years. As regards refractory bricks, blocks, and tiles, the figures are as follows:

1925	1,785,600
1926	2,209,949
1927	5,094,828
1928	4,854,960

The Committee is asked to recommend an Order that all imported refractory bricks, blocks, and tiles should be marked with an indication of the country of origin; that the indication of origin be indelibly impressed on each brick, block, or tile; and that the indication should be on the bricks, &c., at the time of importation, as well as at the time of sale subsequently in this country.

When the evidence in regard to building bricks and tiles was concluded, special evidence was called with regard to the refractory bricks, blocks, and tiles.

Evidence in regard to refractories was given on Tuesday, Oct. 8, by Mr. *W. J. Rees*, B.Sc., F.I.C. (Lecturer-in-Charge of the Department of Refractory Materials, at the University of Sheffield), who said that he devoted his full time to experimental work in connection with the manufacture and use of refractory materials. Dealing with the production of refractory bricks, he said they were made to a large extent in this country from materials obtained both here and from abroad. There were two general methods of producing refractories. The old method was to fill the material into a mould, tamp it frequently, remove it subsequently from the mould to the drying floor and then to the kiln. The other method was to prepare the clay in some type of machine, and then to feed the prepared material into a press. Frequently the operation was entirely automatic. Probably the majority of firebricks at present were pressed by machine, but the silica bricks, of highly siliceous material, having little plasticity, were made by hand methods in this country. Marking during manufacture was the simplest possible matter, for it could be done either by providing embossed lettering in the base of the mould or in the die which pressed the material out to shape. The four principal types of imported refractory bricks were the magnesite (or magnesia), the chrome, the silica, and the fireclay bricks. It was impossible to differentiate between the British and foreign bricks by their appearance, because the methods of production, the materials used, and the quality of some of the bricks produced abroad and in this country were very similar.

For plants manufacturing coke and gas generally there had been a tendency during recent years to change over from the ordinary fireclay brick to the highly siliceous brick, and there was a very marked tendency for bricks to be imported for that purpose. In almost every case in which he had discussed the matter with users, they had expressed a preference for the British-made brick, but it was quite impossible to distinguish between the foreign and the British. Referring to firebacks made of refractory materials, he said he understood they were being imported into this country. Marking was a matter of everyday practice in firebrick works in this country.

Mr. Malcolm Hilbery, K.C., cross-examining, put it to witness that some of the Continental clays, as, for instance, the Dutch clays used for hand-made bricks, were very plastic, so that it would be difficult to mark them, and if they were to be marked by means of an impression in the moulds it would be necessary to leave the clays in the moulds for some time.

Mr. *Rees* did not agree that the foreign clays were very plastic, or that it would be necessary to leave them in the moulds for some time if a mark were applied by means of an impression in the moulds. His general opinion was that if it were possible to make a brick in a hand mould and turn it out of the mould so that it did not deform in the process of turning out, it was perfectly possible to mark it while it was in the mould. Replying to a suggestion by Counsel that he had never had experience of the ordinary manufacture of hand-made bricks of high plasticity, he said that for nearly twenty years he was in technical control of a large works, one of the departments of which manufactured bricks, and he had had experience of hand-made bricks of high plasticity clay.

The next suggestion made by Counsel was that the clay would

adhere to the lettering in the mould, so that the marking would not be clear; but Mr. Rees replied that in all probability it would not, because the first step in the process was to sprinkle sand at the bottom of the mould, which prevented adhesion.

Mr. Hilbery: Even wet sand does not prevent it adhering.

Mr. *Rees*: It does not prevent it from a strictly academic point of view, but from a practical point of view it does.

Mr. Hilbery: Well, that is where we are at issue.

Mr. E. J. Rimmer (Counsel for the National Federation of Building Trades Employers), who was asked if he wished to cross-examine, said the Federation did not consider it was in a position to oppose the application for the marking of refractory goods.

The Chairman asked if there were bricks which might be regarded as semi-refractory.

Mr. *Rees* replied that the definition was not perfectly clear-cut, but, generally speaking, any brick used for a furnace, or which had to resist any temperatures above the normal, was classed as a refractory brick.

Mr. *H. J. C. Johnson* (Managing Director of the Leeds Fireclay Company, Ltd., and President of the National Federation of Clay Industries) also gave evidence, and in the course of it was asked by the Chairman what were the views of the metallurgical interests with regard to the marking of refractories. (At the same time, the Chairman appreciated that they had not opposed the application.) Mr. Johnson replied that he should think they would be in favour of marking.

Mr. *Frank Russell* (Chairman and Managing Director of General Refractories, Ltd., Sheffield; a Director of the Midland Refractories Company, Ltd., Ambergate, and a number of other concerns engaged in the refractories industry; President of the National Association of Clayworks Managers; a Past-President of the Refractories Association of Great Britain; a member of the Council of the Ceramic Society; and a member of some of the metallurgical societies) gave evidence with regard to refractories, and claimed to be well acquainted with the position and views of producers and users, as well as of those who produced the raw materials for the making of refractories. Many people concerned with the production of steel, he said, had no ready means of determining whether a refractory brick was British or foreign. Though the head of the purchasing department of a large steelworks, for example, might know the origin of the refractory bricks he bought, there was a large number of smaller users who bought from merchants and had no means of distinguishing between the British and foreign. The British manufacturers claimed that, though in appearance, size, and shape there was little to choose between the British and foreign bricks, the former were superior in quality, and, in view of the preference that was to his knowledge expressed by British users for British refractory bricks and blocks, he submitted that the foreign bricks and blocks should be marked.

The indications of origin should be applied to the foreign bricks and blocks, he suggested, in letters not less than half-an-inch high; there was no difficulty in marking any of the four principal refractory bricks, blocks, and tiles imported—the magnesite, chrome, silica, and fireclay—and cost of so doing was negligible.

There were many cases in which the owners of plants had no knowledge of the origin of the refractory materials used in them. In reply to a question, he said he was unable, off-hand, to refer to specific cases, but could find hundreds without difficulty. They ought to be in a position to know by looking at the materials whether they were British or foreign. There was a huge responsibility, he added, resting upon those who were using large steel furnaces. It was conceivable that a collapse and even disaster might occur, and he had known cases in which roofs had fallen in or some other serious trouble had arisen. It might be concluded that such a disaster was due to the use of unsatisfactory refractory bricks or blocks, in which case it would be necessary to find out who made them. If each brick were marked, it would be easy to apportion the blame in the right quarter, but if the bricks were not marked, either British or foreign makers might be blamed unjustly. Justice should be done, however, in whatever direction the blame might lie.

The inquiry was adjourned until Monday, Oct. 21.

GAS AND ELECTRICITY ON HOUSING ESTATE.

Dual System Favoured at Rochdale.

In submitting the minutes of the Housing Committee of the Rochdale Corporation, Councillor Wycherley drew attention to an application to the Ministry of Health for their approval of the building of 104 more houses on the Spotland estate. It might be interesting to the Council, he said, to learn that they had let for occupation the 2000th Corporation house in the town.

Answering Councillor Holt, Councillor Wycherley said he had promised him that he would bring the question of the lighting and the heating service for the houses before the Committee. He did that, and pointed out to the Committee that the rest of the houses on the Spotland estate had the dual system. The question was debated at some length, and a resolution was moved that the dual system be continued; but out of a full Committee of 14, only the mover and seconder voted for the dual system. The Committee were anxious to give the amenities most desired by the people who had to live in the houses, and he was informed by the Housing Manager that the greatest satisfaction was being given in the purely electric house. At Spotland, where they had the dual system, he was told that 48 gas boilers had been taken out and electric boilers substituted at the tenants' own expense. The Committee, therefore, decided in favour of the purely electric house.

Councillor Holt moved as an amendment to the minutes that arrangements be made for a dual service to be installed in the new houses on the Spotland estate, and that gas wash-boilers be provided in these houses. He said that when the first houses on the Spotland estate were built, gas and electricity were the rule, and the Gas Committee took their services up there and made provision for any extension there might be on the estate. The Gas Committee had been given no opportunity of quoting for the cooking and heating services for these houses. The Council had sanctioned the spending of large sums of money to bring their works up to date; they were spending money on propaganda and advertising and had secured excellent results. Last year, they sold 1232 cookers, 375 gas fires, 46 geysers, and 1887 boilers—a total of 3540 appliances—which was double the number sold in the previous year. It was most disheartening to him and his Committee that the Housing Committee, by this action, should damn their work as they had done. Over 98 p.ct. of the houses erected by private builders gave the dual service. These houses were for moneyed people who could afford luxuries, while the municipal houses were supposed to be built for people of moderate means, and it was not fair that the former should have facilities which the latter could not enjoy. The charge for putting in a gas service was £2 10s. per house, and interest and sinking fund on this amount worked out at a halfpenny per week per tenant, whereas the tenants would save at least 1s. a week owing to the lower cost of heating by gas.

The speaker gave figures to show that in Manchester and Liverpool nearly all the houses had the dual system, and he read an extract from a newspaper which stated that all the medical advisers who were in attendance on the King during his recent illness used gas fires. He warned the Council that they would be embarking on a very dangerous policy if the minute went through. There was ample room for both these trading concerns, but if they were going to fight in this way both concerns would suffer. He contended that the use of gas for heating purposes was less costly and was a saving in time, and he felt very strongly that the tenants of these houses ought to have the option of choosing between the two methods. The Gas Committee had their mains laid up to this estate, and he thought in common fairness they ought to have some share of the Housing Committee's business.

Councillor Barraclough seconded the amendment.

Members' Experiences.

Councillor Duckworth, in supporting the amendment, said he had recently fitted up an electric house, being rather taken with the idea of an entire electric equipment. He had been compelled, however, acting on experience and judgment, to add a gas service to his house, and he had no regrets for having done it. In view of the small additional cost which the dual system involved, he thought that gas ought to be put in these houses. For lighting purposes electricity stood alone, but gas undoubtedly held the field for heating.

Alderman Clark, though a member of the Electricity Committee and not of the Gas Committee, supported the amendment from a sense of fairness. He thought people ought to be given an opportunity of choosing for themselves which of the two services they would have.

Councillor Lancaster supported the amendment on the ground that he had had several complaints from the "all-electric" houses at Castleton, where the tenants, he said, would have liked the dual system.

Helping Neither Concern.

Alderman Bryning commended the Chairman of the Gas Committee for the fight he was making for his own concern and the Manager for the energy and enterprise he was showing, but said he was impressed by the argument that the putting in of a dual service would help neither concern. The division of the small consumption would mean a loss to both, and, further, an alteration would be necessary in the construction of the houses. His own personal experience was that he had had an electric stove taken out of one room and a gas stove substituted.

Councillor A. Clarke, as a member of both Committees and a user of both gas and electricity, said his experience was that for water heating purposes gas beat electricity. He had a gas heater in the bathroom and an electric heater in the kitchen, and he got ten times more hot water from the gas than the electricity at half the cost. Alderman Bryning's argument that the two services should not be put in because the two Departments would suffer had nothing to do with the case. If he and other members of the Council could afford to have it in their houses everybody in the town ought to have the same opportunity.

A Question of Cost.

Councillor Taylor emphasized Alderman Bryning's point that both Departments would suffer if the dual service were put in, and suggested that nobody was compelled to take an all-electric house. There was a long waiting list, and if a person wanted a house with gas there was no necessity for him to apply for one of these. The question from the point of view of the Corporation and the ratepayers was whether they were going to lose money on the transaction. The estimate was that with the dual service the houses would cost between £4 and £5 more, and it was also computed that neither the Electricity nor the Gas Department would be able to make a profit, but that they would in fact lose money. It was all very well to say the private builder put in both services; he was recouped for his

outlay, but here there was no method of meeting the cost except by increasing the rents.

Alderman DAVIDSON supported the amendment on the broad ground that people ought to have freedom of choice.

Alderman DIGGLE and Councillor DUTTON also supported the amendment.

HOUSING CHAIRMAN'S REPLY.

Councillor WYCHERLEY said he would be very glad if the Council would decide what services they had to put in these houses. This was the third time he had had to defend the Housing Committee for putting in only electricity. It was most unfortunate that the discussion should have turned on the merits and demerits of gas and electricity. The question before the Housing Committee was the building of houses which would be acceptable to the people of to-day and the people of twenty and forty years hence, and they were also guided by what they were told by the Housing Manager, who had no hesitation in saying that the preference of those applying was for houses which were purely electric. At Kilworth Street, where they had some houses "all-electric" and some on the dual system, people in the latter, they were told, were asking to be allowed to transfer to the former. Most of the houses built by local authorities up and down the country had been on the dual system, but during the last twelve months they had had three deputations from other municipalities for the purpose of seeing their "all-electric" houses and of interviewing the tenants. They visited six of these houses, and in all except one the housewives said they preferred electricity on account of its utility and cleanliness, while they found very little difference in cost. He was personally not concerned whether they had the dual system or not; but he wanted the question definitely settled.

The amendment was declared carried, and the minutes as amended were approved.

OVERSEAS OPPORTUNITIES.

[From the Board of Trade Journal.]

Canada.

Exhauster Fans.—The Officer-in-Charge of H.M. Trade Commissioner's Office at Winnipeg reports that a local firm has approached him regarding its desire to receive quotations for the supply of a pair of exhauster fans and motors. British manufacturers desirous of offering exhauster fans can obtain further particulars of this inquiry upon application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1. (Ref. A.X. 8643.)

TRADE NOTES.

"Dri-Gas" Plant for Dewsbury.

On the recommendation of the Borough Gas Engineer and General Manager (Mr. H. L. Bateman), the Dewsbury Corporation have approved the installation of "Dri-Gas" plant at the works at Savile Town.

Coppée Coke Ovens at Dagenham.

A contract of special interest has just been placed with the Coppée Company (Great Britain), Ltd., 44, Grosvenor Place, London, S.W. 1, for a large coking and bye-product installation to be erected on the banks of the River Thames at Dagenham, Essex, for the Ford Motor Company (England), Ltd., 93-97, Regent Street, W. 1. This contract forms part of a huge scheme of development by the Ford Motor Company in this country.

The Story of Asbestos.

From Celite Products Corporation, of Windsor House, Victoria Street, S.W. 1, we have received a publication in connection with Johns-Manville products, entitled "The Story of Asbestos." The booklet traces the growth and introduction of asbestos from its discovery, and indicates the methods of mining and manufacture of the products. Johns-Manville mines asbestos, and carries on all the manufacturing processes from the crude ore to the finished materials of widely varying uses and appearance.

Foster-Vanstone Flanges.

From Messrs. Foster Bros., Ltd., of Lea Brook Works, Wednesbury (who are associated with the Midwest Piping and Supply Company, of St. Louis, U.S.A.), we have received a copy of their List No. P 87 dealing with "Foster-Vanstone Flanges." In addition to other useful information to pipe users, in this well-illustrated brochure is described the method of manufacturing the flanges. The process, while giving a square inner corner to the flange, so thickens the metal as to give a lap, after machining, at least equal to the pipe-wall thickness. With these flanges, in conjunction with appropriate bolting flanges, a joint is produced capable of carrying any pressure up to the limit of the pipe itself. Sectional illustrations are given of the "Foster-Vanstone," "Midwest," and "Seleweld" pipe joints.

CONTRACTS OPEN.

Heating Equipment.

The Smethwick Education Committee invite tenders for school heating equipment. [See advert. on p. 263.]

During the busiest shopping hours at Pwllheli on the night of Oct. 12, the electric light failed, leaving crowded shops in darkness for half-an-hour. Shopkeepers resorted to candles and carried on business with difficulty.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market is still on the whole weak and unsettled, strength in the screened steams of both Northumberland and Durham being the only feature. Gas coals are in very slow demand, though perhaps slightly more inquiry has been noticeable. It is reported that canal transport facilities on the Continent are improving; the drought conditions having caused difficulties in this direction for some time. This, it is hoped, may improve shipment prospects to some extent, though it is feared that the many unsettling features in the situation in this country will continue to impede trade for some time.

Wear Special gas coals are quoted nominally at 17s. 3d. to 17s. 6d. f.o.b., and best qualities 16s. 6d. to 16s. 9d. Seconds are weak at 15s. Coking coals are still a very disappointing market, the demand having apparently gone off altogether. Quite good qualities are obtainable at 15s. Best Durham bunkers are quiet at 15s. 6d., with any quantity of seconds offering at 14s. 6d. Best Northumberland screened steams are fully sold for some time ahead, and firmly quoted at 16s. 6d. f.o.b.

There is steady pressure for gas coke, and 24s. 6d. to 25s. is firmly quoted for shipment.

YORKSHIRE AND LANCASHIRE.

A firm tone prevails in the export trade, and recent quotations are maintained. The production of best hards and nuts continues to be fully taken. In the secondary qualities there is less pressure. There is no difficulty in meeting the increased demand for gas coals. The industrial fuel trade is little altered. For washed nuts there is a stronger request, but the supply seems equal to the demand. Furnace coke remains active. The inquiry for rough slack, however, is not so active, yet recent prices are maintained.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire.—Hards, Association, bunkers 19s., export 18s. to 18s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 18s. to 18s. 6d.; washed doubles, bunkers 18s. 6d., export 17s. to 18s.; washed singles, export 16s. 6d.; washed smalls, bunkers 15s. 9d. to 16s., export 15s.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.; smithy peas, export 18s. 6d. to 19s. 6d.

West Yorkshire.—Hartleys (f.o.b. Goole), bunkers 17s. 6d., export 17s. to 18s.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 18s.; washed doubles, export 16s. 3d. to 16s. 9d.; washed singles, export 16s.; washed smalls, bunkers 15s. 3d., export 14s. 6d.; unwashed trebles, export 17s. 6d.; unwashed doubles, export 15s. to 16s.; rough slack, bunkers 13s. 6d., export 11s. 6d. to 12s.; coking smalls, export 12s.

Derbyshire and Nottinghamshire.—Top hards, bunkers 19s., export 18s. to 18s. 6d.; cobbles, export 17s. 6d. to 18s. 6d.; washed trebles, export 18s.; washed doubles, export 17s. to 17s. 3d.; washed singles, export 16s. to 16s. 6d.; washed smalls, bunkers 15s. 3d. to 15s. 6d., export 14s. 6d.; unwashed doubles, export 16s.; rough slack, bunkers 13s. to 14s., export 12s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, bunkers 17s. to 18s.; export 16s. 6d. to 17s.; gas coke, export 22s. 6d. to 25s.; furnace coke, export 23s. to 24s.; washed steam, Goole (West Yorks.), bunkers 17s. 6d.; Hull (West Yorks.), bunkers 17s. 9d.; Hull (South Yorks.), bunkers 18s., export 17s. per ton.

MIDLANDS.

With a few exceptions among unpledged collieries, pits are still working very irregularly. The slow expansion of the trade in household coals is only faintly perceptible so far as the better grades are concerned, owing to the small impression which has been made on stocks. There are signs of reviving activity in the medium and lower grades, though sellers do not as yet find demand very active for fuel suitable for use in central heating systems.

Inquiries for industrial coals are rather more encouraging. The great point is that output has been kept down pretty well to consumptive requirements. Prices are low, and they give little sign of resilience. But with no marked superfluity of supplies in any direction values are steady. Associated coalowners do not like to see independent competitors making the pace. There is much speculation as to the effect of Government intervention on the internal organization of the industry, particularly from the point of view of marketing.

Bakers' nuts, which have a dual position in the market, being used for domestic as well as for industrial purposes, tend to appreciate. Collieries quote 20s. upwards. The trade in slacks is equable quotations for good rough grades moving between 6s. and 9s. "D.S." nuts have firmed up slightly. Blast-furnace coke is no easier to get, and pig-iron producers are asking a premium on some of their grades. There is no general stringency in the pig-iron market, however.

Public Lighting at Seaford.—The Seaford Urban District Council have accepted the Seaford Gas Company's tender for public lighting for three years as from Nov. 11 next. The Company have also a contract for lighting the Western Parade for five years as from March last.

Lecture to Sheffield Staff.—A lecture took place at the chief showrooms of the Sheffield Gas Company on Oct. 17, when a visit was made to Sheffield by Mr. F. Brinsley, of Radiation, Ltd., for the purpose of lecturing to the fitters and staff of the Distribution Department on "The Fixing of Gas Appliances." Over seventy members of the staff attended, and an interesting discussion ensued at the conclusion of the lecture.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct.* 21.

The prices of tar products are very steady indeed, and there are no changes to report.

Pitch remains about 47s. 6d. per ton f.o.b.

Creosote for export is 6¾d. per gallon f.o.b.

Pure toluole is 2s. 3d. to 2s. 4d. per gallon; 95/160 solvent naphtha, is about 1s. 5d.; pure benzole, about 1s. 11d.; and pyridine bases, 3s. 9d. to 4s. per gallon.

Tar Products in the Provinces.

Oct. 21.

Markets for tar products have remained firm throughout the past week, and prices are without variation.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s. Pitch—East Coast, 47s. 6d. f.o.b. West Coast—(f.a.s.) Manchester, 42s. to 42s. 6d.; Liverpool, 45s. 6d. to 46s. 6d.; Clyde, 45s. 6d. to 46s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 2d. to 2¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 5½d. to 2s. 6½d. prompt. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 11	per gallon at works
Motor ,, . . .	1 5	,,	1 6	,, ,, ,,
90 p.ct. ,, . . .	1 7	,,	1 8	,, ,, ,,
Pure ,, . . .	1 10	,,	1 11	,, ,, ,,

Coal-Tar Distillation Products was registered as a public Company on Oct. 18, with a nominal capital of £150,000 (100,000 participating preference and 45,000 ordinary of £1, and 100,000 founders' shares of 1s.), to adopt an agreement with Conte Ing. Gustavo Corinaldi, and to carry on the business of distillers of solid, liquid, and gaseous substances derived from coal. Registered office: Dashwood House, 69, Old Broad Street, E.C. 2.

Street Lighting at Saltburn.—The Redcar Gas Department have been successful in obtaining the contract for street lighting from the Urban District Council of Saltburn-by-the-Sea, which is in their area of supply. The Gas Department lost this contract ten years ago to the Electric Power Company, but have now been able to regain it. The contract provides for: 18 10-light inverted lamps; 40 6-light and 4-light inverted lamps; and 142 2-light ordinary street lanterns, at £700 per annum.

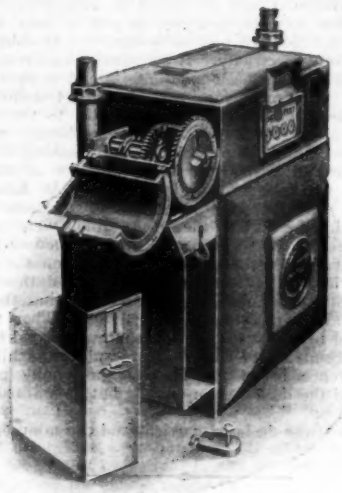
New Steamer for the Gas Light and Coke Company.—Messrs. J. Crown & Sons, Ltd., of Sunderland, have launched the steamer "Torchbearer," of 1850 tons deadweight, which has been built to the order of Messrs. Stephenson Clarke and Associated Companies, Ltd., on behalf of the Gas Light and Coke Company. The vessel has been specially designed for the owners' coal trade, with a lowering funnel for passing under the bridges on the Thames. The vessel was christened by Mrs. Plummer, wife of Mr. S. C. Plummer, of London.

Results at Oswaldtwistle.—According to the annual report of the Oswaldtwistle District Council Accountant, the net profit on the gas-works was £841. Against the revenue appropriation account were several charges, including £308 for constructing a new roadway; £65 for new weighbridge; and £1121 for new offices. The reserve fund was reduced by £1513 to a total of £3551. The capital outlay during the year was £12,025 (a new gasholder having been erected), making the total outlay on the gas-works to March 31 £120,650, the mortgage debt outstanding being £40,405.

Proposed Extensions at Porthcawl.—Mr. Russell Mabley presided over a special meeting of the Gas Committee of the Porthcawl Council, convened to consider the proposed extension of the gas-works. Objection was raised on the ground that the Council had made arrangements with the General Electric Company for the lighting of the town by electricity. Mr. Aston Bremner was of the opinion that the advent of electric light would not interfere with the gas-works. He suggested that a Committee be selected to consult with the Gas Manager and the Clerk on the question. This was agreed to.

The Blackpool Corporation have decided to apply to the Ministry of Health for permission to borrow £6000, repayable in 10 years, for street gas lamps; £4375, repayable in 10 years, for clockwork controllers for street gas lamps; and £10,000, repayable in 10 years, for other gas appliances.

The Plymouth Corporation have approved the Gas Committee's proposal to apply to the Minister of Health for sanction to borrow £5500, of which £4300 is the estimated cost of acquiring premises at Devonport for showrooms and the remainder that of adapting the premises, which are also to be used as a collecting office. The Plymouth and Stonehouse Gas Company have handsomely equipped showrooms in the eastern part of the borough, and the proposed new rooms are in the western part, the former borough of Devonport, which the Corporation supplies with gas.



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STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Oct. 18.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug 15	5	5	Aldershot 5 p.c. max. C. .	70—75	..	73—73½
413,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	73—76	..	..
1,561,868	,,	Sept. 26	7½	7½	Alliance & Dublin Ord. .	95—98	..	96½—98
874,000	,,	July 11	4	4	Do. 4 p.c. Deb. . .	62—65	..	..
643,655	,,	Aug. 29	7	7	Barnet Ord. 7 p.c. . .	112—115	..	112½—113½
800,000	1	May 9	1/4½	1/4½	Bombay, Ltd.	½—½	..	18/3
172,500	10	Aug. 29	8½	9	Bournemouth 5 p.c. . .	12½—13½	..	..
880,050	10	,,	7	7	Do. B 7 p.c. . .	12½—12¾	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c. .	10½—11	..	..
80,000	Stk.	July 11	3	3	Do. 3 p.c. Deb. .	54—57	..	..
163,935	,,	,,	4	4	Do. 4 p.c. Deb. .	72—75	..	..
857,900	,,	Aug. 29	7½	7½	Brighton & Hove 6 p.c. Con.	113—116	..	..
371,880	,,	,,	6½	6½	Do. 5 p.c. Con.	100—103	..	..
1,327,500	,,	July 25	5	5	Bristol 5 p.c. max. . . .	88—89a	..	
355,000	,,	Sept. 12	7½	7	British Ord.	115—118	..	115½—116
100,000	,,	June 27	7	7	Do. 7 p.c. Pref. . . .	112—117	..	..
180,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	71—74	..	..
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	94—97	..	96½
100,000	10	May 30	8	8	Cape Town, Ltd. . . .	9—10	..	10
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. . .	6½—7½	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb. . .	71—76	..	..
600,000	,,	July 25	6	6	Cardiff Con. Ord. . . .	98—101	..	..
227,640	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb. .	99—102	..	..
137,150	,,	Aug. 15	6½	5	Chester 5 p.c. Ord. . . .	87—92b	..	..
98,936	1	Oct 10	†2/-	†2/-	Colombo Ltd. Ord. . . .	34/—36/-*	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. . .	19/—21/-*	..	..
876,402	1	Oct. 10	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	23/6—25/6*	..	23/6
147,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-*	..	
9,073,280	Stk.	July 25	7	5	Commercial Ord.	93—96	..	93
475,000	,,	June 13	3	3	Do 3 p.c. Deb. . .	56—59	..	..
787,560	,,	Aug. 15	7	7	Croydon sliding scale . .	105—108	..	105½—106
400,100	,,	,,	5	5	Do. max. div. . . .	81—84	..	82
542,270	,,	Aug. 29	10	7	Derby Con.	118—121e	..	..
55,000	,,	June 27	4	4	Do. Deb.	68—71e	..	..
200,000	,,	Aug. 29	5	5	East Hull Ord. 5 p.c. . .	73—76	..	..
1,000,180	10	Sept. 12	†7	†4	European, Ltd.	13½—15½	—1	13½—15½
19,705,480	Stk.	July 25	5½	5½	Gas Light & Coke 4 p.c. Ord.	18/1½—18/7½f	+·/3	18/—18/7½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	61—63	..	61½
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	70—73	..	70—72
3,633,620	,,	June 13	3	3	Do. 3 p.c. Con. Deb. .	55—58	..	56½—58
3,648,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	97—100	..	99½
69,500	,,	Aug. 29	7	7	Hastings & St L. 5 p.c. Conv	98—103	..	..
288,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	77—82	..	..
10,000	10	Oct. 10	†10	†10	Hongkong & China, Ltd. .	13½—14½*	..	..
212,800	Stk.	Aug. 29	6	6½	Hornsey Con. 3½ p.c. . .	84—87	..	..
1,976,000	,,	May 30	10	20	Imperial Continental Cap.	380—400	—10	390—402
238,180	,,	Aug. 15	8½	8½	Do. 8½ p.c. Red. Deb.	70—75	..	..
138,242	,,	Aug. 15	7½	8	Lea Bridge 6 p.c. Ord. . .	115—118	..	..
3,145,907	,,	Aug. 15	6½	6	Liverpool 5 p.c. Ord. . .	94—95b	..	..
600,000	,,	Sept. 26	7	7	Do. 7 p.c. Red. Pref.	99—101b	..	..
186,756	,,	Aug. 29	8	9	Maidstone 6 p.c. Cap. . .	122—127	..	..
69,480	,,	June 27	3	3	Do. 3 p.c. Deb. . .	53—56	..	..
95,000	5	June 13	†8	†10	Malta & Mediterranean .	5½—6	..	..
392,000	—	Oct. 1	5½	5½	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb. . . .	96—99	..	
841,920	Stk.	May 30	†5	†9	Montevideo, Ltd. . . .	105—108	..	106—10⁷/₈
2,051,816	,,	July 25	5½	5	Newcastle & Gateshead Con.	16/9—17/3d/f	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref. .	71½—72¾d	..	..
691,705	,,	June 27	3½	3½	Do. 3½ p.c. Deb. .	67½—68¼d	—½	..
181,780	,,	Aug. 29	7/1/0	7½	North Middlesex 6 p.c. Con.	110—115	..	..
400,000	,,	Apl. 24	9	7	Oriental, Ltd.	111—116	..	112—1/2½
205,162	,,	June 27	8	8	Plym'th & Ston'house 5 p.c.	110—113	..	..
424,416	,,	Aug. 29	8½	8	Portsm'th Con. Stk. 4 p.c. Std.	113—118	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	80—83	..	..
2,284,464	1	June 27	—	†5	Primitiva Ord.	33/—35/-	..	33/10½- 35/-
244,500	100	June 8	4	4	Do. 4 p.c. Red. Deb. . .	92—95	..	..
695,000	Stk.	July 25	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	June 27	4	4	Do. 4 p.c. Cons. Deb. . .	79—82	..	81½—81⅞
150,000	10	Sept. 26	6	6	San Paulo 6 p.c. Pref. . .	8½—9	..	8⅞—9
1,736,968	Stk.	Aug. 29	6½	6½	Sheffield Cons.	108—110e	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb. . . .	74—77e	..	..
90,000	10	June 13	‡4	‡4	South African	4—6	..	..
6,609,895	Stk.	July 26	7½	5	South Met. Ord.	99—101	..	99½—100½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	106—109	..	..
1,895,445	,,	July 11	3	3	Do. 3 p.c. Deb. . .	54—57	..	..
784,000	,,	Sept. 12	6½	6½	Do. 6½ p.c. Red. Db.	98—100	..	..
91,800	,,	Aug. 15	8½	8½	South Shields Con. . . .	109—111d	..	
1,843,795	,,	July 25	6½	6½	South Suburban Ord. 5 p.c.	102—105	..	102
468,887	,,	June 27	5	5	Do. 5 p.c. Deb.	93—96	..	94½—95½
647,740	,,	Aug. 15	5	5	South'mpton Ord. 6 p.c. max.	77—80	..	..
181,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70—73	..	..
179,014	,,	July 25	8	8	Sutton Ord.	116—119	..	..
67,828	,,	June 27	5	5	Do. 5 p.c. Deb. . .	90—93	..	..
260,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref. .	100—102	..	..
200,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
1,002,275	,,	Aug. 15	6⅝	6⅝	Tottenham District Ord. .	105—108	..	105
180,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,355	,,	June 13	4	4	Do. 4 p.c. Deb.	74—77	..	..
289,994	,,	Aug. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c. . . .	93—98	..	..
98,880	,,	,,	5	5	Do. 5 p.c. pref. .	85—90	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	135—140	..	..
355,686	,,	,,	7½	7½	Do. B 5½ p.c. .	112—117	..	..
432,585	,,	,,	6⅜	6⅜	Do. C and New	95—100	..	98—99
360,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c. .	105—110	..	105
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c. . .	113—118	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref . . .	87—92	..	..
68,416	,,	June 27	3	3	Do. 3 p.c. Deb. . . .	54—57	..	..
284,742	,,	,,	4	4	Do. 4 p.c. Deb. . . .	74—77	..	..
207,580	,,	,,	5	5	Do. 5 p.c. Deb. . . .	93—96	..	..

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